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WAR MACHINE

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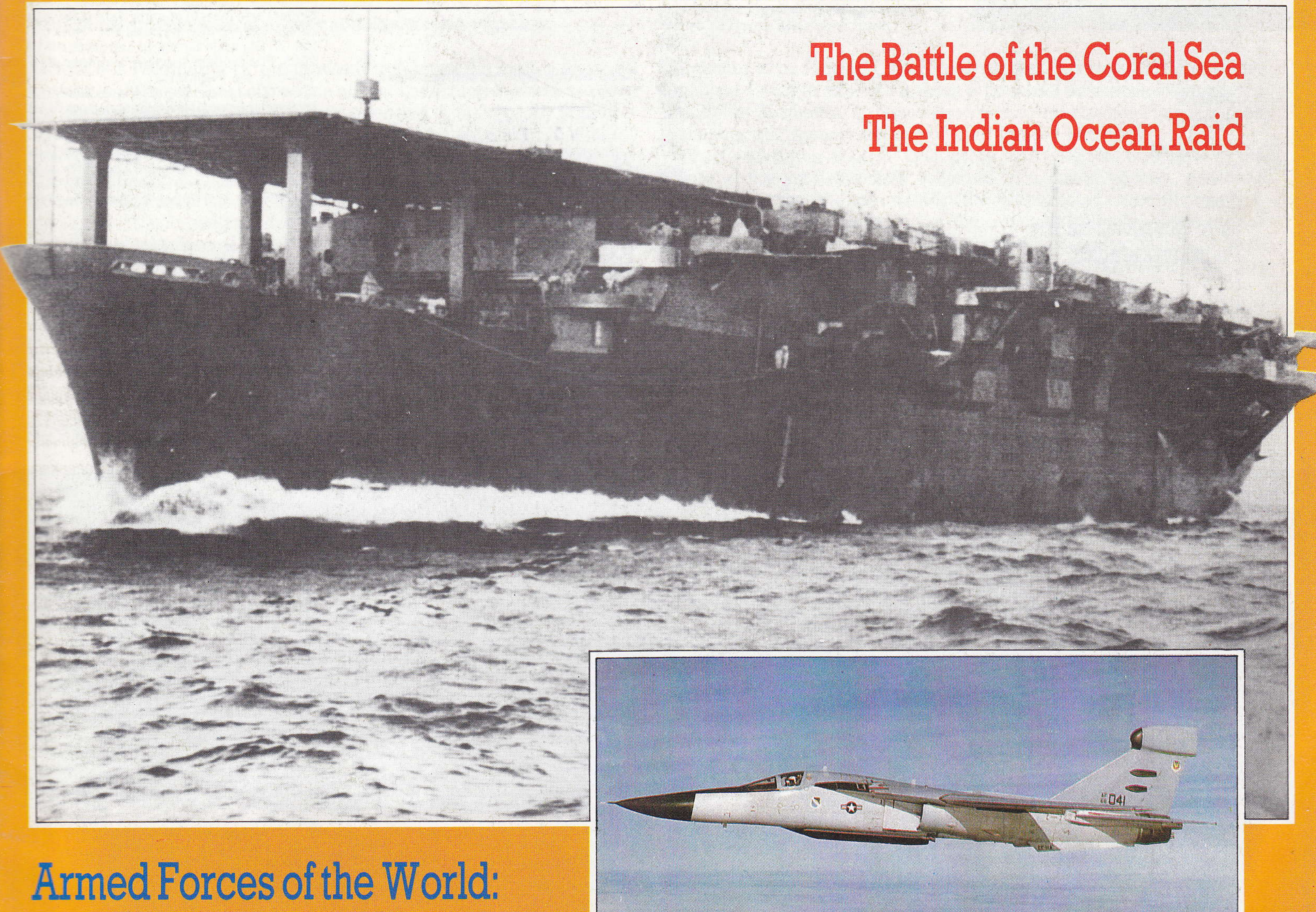

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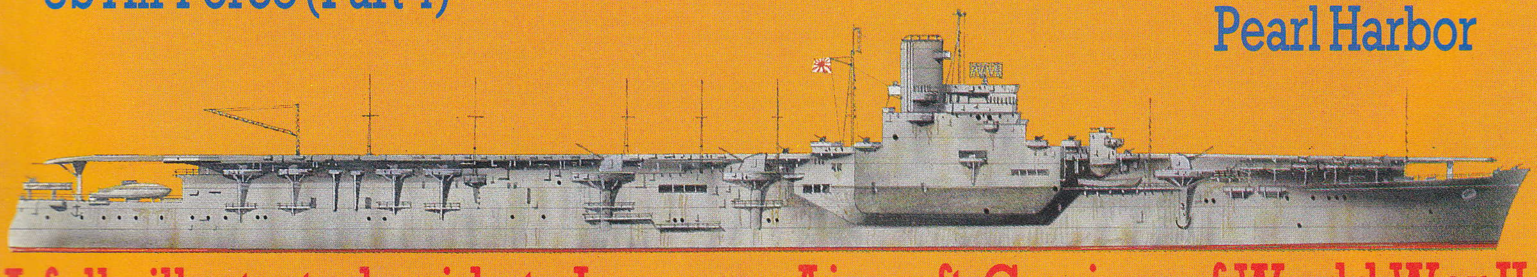

A fully illustrated guide to Japanese Aircraft-Carriers of World War II

WAR MACHINE

Volume 4 **Issue 48**

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Armed Forces of the World:

US Air Force (Part 4) iii

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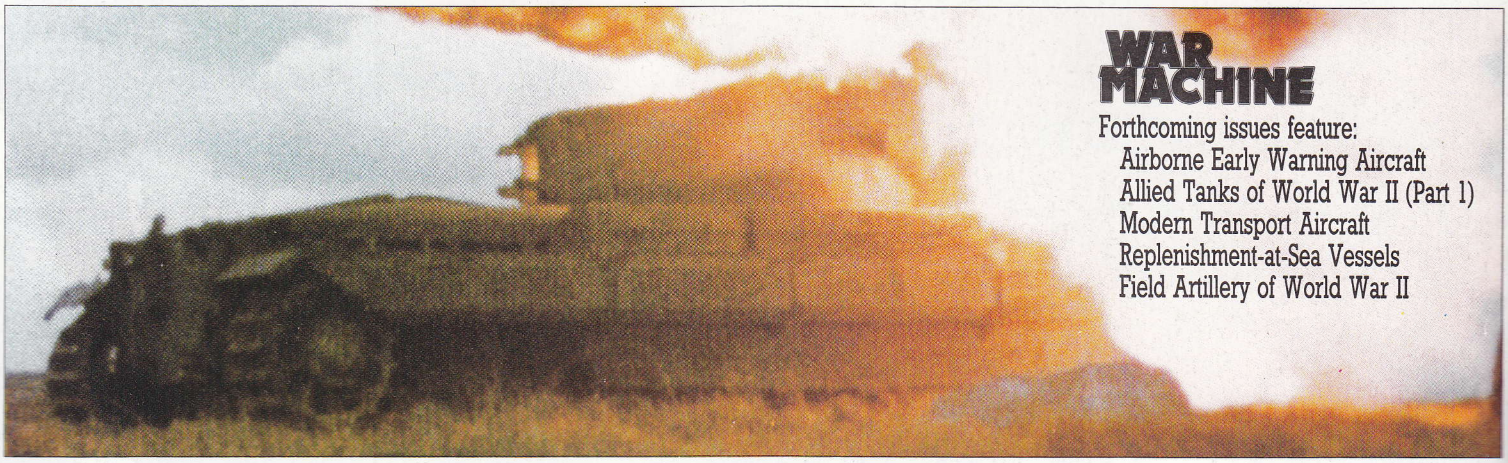

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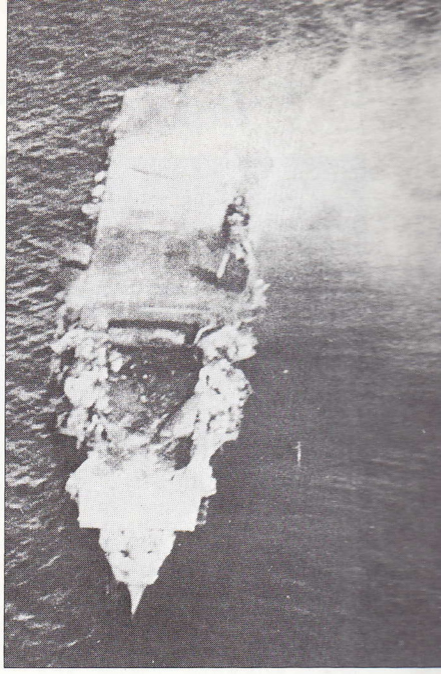
Japanese Aircraft Carriers of World War 11

The six months following 7 December 1941 saw the Imperial Japanese Navy wage one of the most astonishing campaigns in naval history. From the attack on Pearl Harbor to the defeat at Midway, it was carrier power that proved decisive, and the transformation of war at sea was irrevocable.



Last survivor of four Japanese fleet carriers at Midway, Hiryu *was struck by Douglas SBD Dauntless dive-bombers late on 4 June 1942. Burning fiercely and with her flight deck and hangars shattered, she was abandoned and scuttled, sinking some 12 hours later on 5 June.*

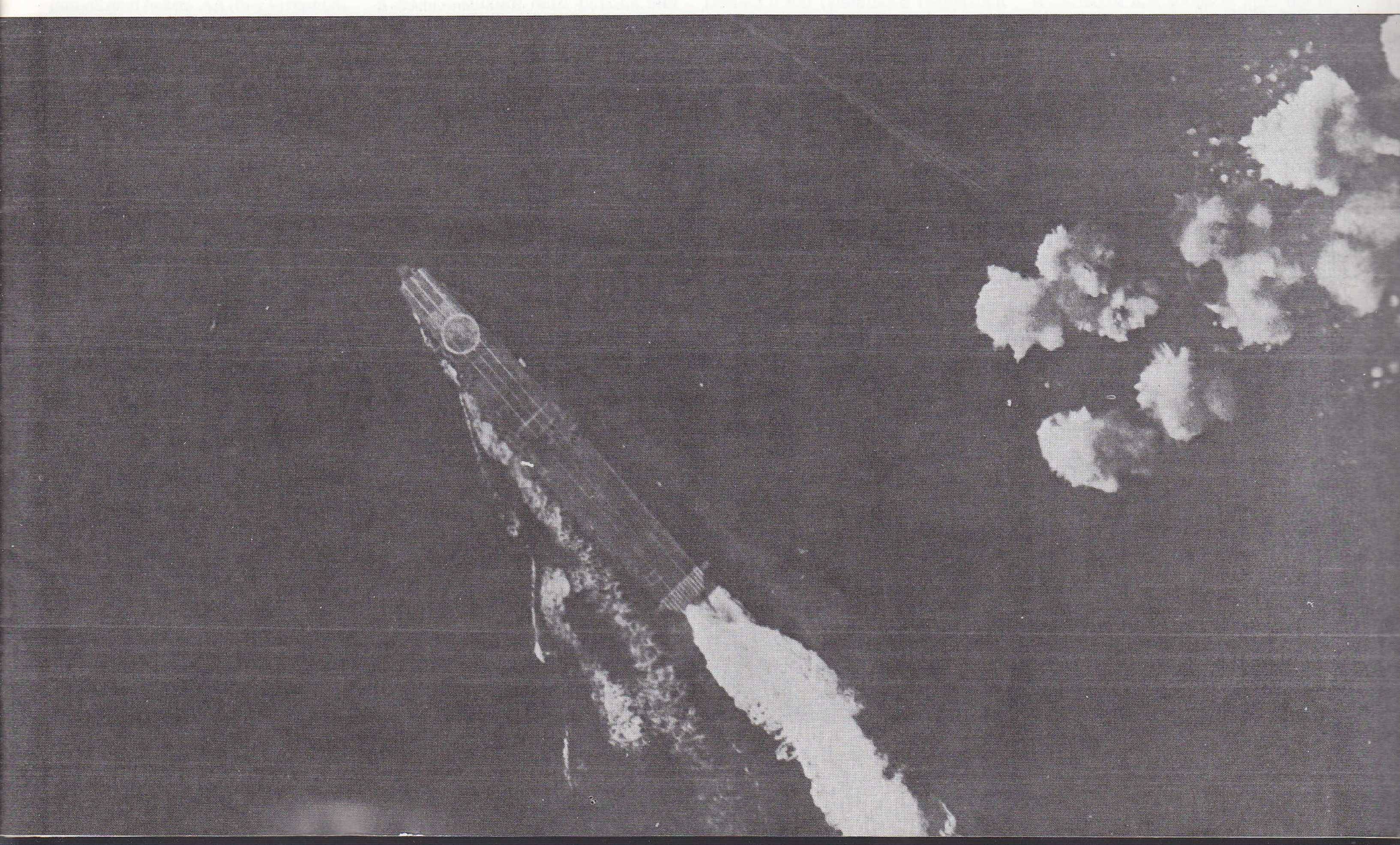
Unlike her Axis partners, Japan was a true maritime power that well understood the potential of aviation at sea. Launching a war of her own choosing in the Pacific, she had not succeeded in significantly outbuilding the Americans in aircraft-carriers but had the advantage that the 11 that she had in service in 1941 did not have to be split between two oceans. The grouping of the six best units into Nagumo's 1st Air Fleet showed bold innovation, a gamble that paid off in exploiting again the old principle of the *Schwerpunkt*, or overwhelming force where it mattered.

In the initial phase of the Pacific war, the Allied fleets were caught ill-prepared and for a while the Japanese seemed unstoppable, but inevitably as their boundaries expanded and their commitments grew, the Japanese had to break up the hard-worked cohesive carrier units. At the same time the Americans, stung to war, prepared their challenge. Coral Sea demonstrated that the enemy could be checked but Midway was a total triumph for American intelligence, organization and strategy.

After Midway, the good days were clearly over for the Japanese. Despite a long period of balance, the advantage slowly changed sides. The 2nd Battle of the Solomon Sea, riposted at Santa Cruz, saw the pendulum at mid-swing. The Saipan amphibious operation forced the Japanese to act in strength against a powerful American defence; the Philippine Sea battle, as it was known, cost the Japanese carriers their main strength, namely the last of their trained aircrews.

Shortly after this, at Leyte Gulf, came Armageddon, with virtually the whole of the surviving fleet engaged in a final, one-way, do-or-die mission to destroy the spearhead of the American advance. Short of fuel, aircrew, aircraft and ammunition, the remnants of the Japanese carrier force had no use other than to act as a lure at a crucial point in the action. They succeeded brilliantly, but in vain, for the Americans were too many.

In the short term, the bold uses to which the Japanese put naval air power proved decisive but, once the war was allowed to drag on, the old tag was once again proved right: 'a good big 'un will always beat a good little 'un.'



Akagi *at speed suffered no damage from the bombs dropped by Boeing B-17s of the 431st Bomb Squadron. Not until the dive bombers from USS* Yorktown *and* Enterprise *entered the battle were the Japanese to be all but annihilated.*

JAPAN

Hosho

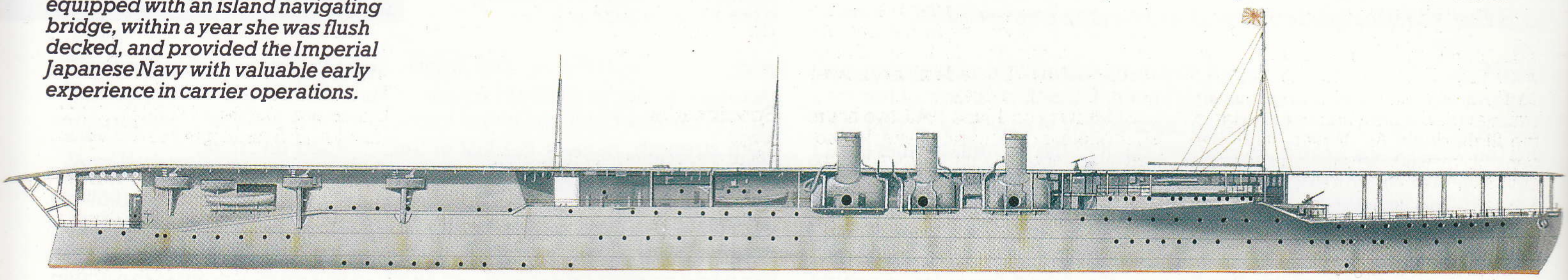
The first carrier built for the Imperial Japanese Navy, like so many others, was a conversion. The naval oiler *Hiryu*, laid down late in 1919, was taken over in 1921 and emerged as the carrier **Hosho** at the end of the following year. The design owed much to a British technical mission, which had broad details of the new British carrier *Hermes* and the details of the Sopwith Cuckoo torpedo-bomber. The original triple-expansion steam engines were replaced by destroyer-type turbines to give a speed of 25 knots and, as in the USS *Langley*, smoke was vented through triple folding funnels, which hinged downwards when flying was in progress.

The ship was the first to have an 'island' navigating bridge, but this proved so unpopular with the pilots that it was removed in 1923. The *Hosho* proved very small and lacked sufficient margin of stability to be able to carry her full armament and complement of aircraft. By the outbreak of World War II her air group had shrunk from 21 to 12 aircraft, and all the original guns had been replaced by light anti-aircraft weapons. However, the *Hosho* provided invaluable experience for the conversion of *Akagi* and *Kaga*, as well as design of *Ryujo*, the first Japanese carrier built as such from the keel up. She also saw considerable action off the China coast in the late 1930s and ferried aircraft during the Sino-Japanese War.

Despite her drawbacks the elderly training carrier served with Carrier Division 3 from December 1941, alongside the *Zuiho*, but after four months in the Palau Islands she was returned to training duties in Japan. Then she became operational again for the Midway campaign, carrying 11 Nakajima B5N 'Kate' bombers to provide reconnaissance for Admiral Yamamoto's battleships.

Finally withdrawn in June 1942, the *Hosho* thereafter led a charmed life. Although damaged by grounding in 1944 and hit twice by American bombs at Kure she was still afloat when the war ended. She had been finally laid up in April 1945 for lack of aircrew to man her aircraft, and was thus one of the few Japanese carriers still in existence on VJ-Day. She was to have a second lease of life, however, for she was recommissioned as a transport to repatriate Japanese servicemen from all over the Far East. She continued in this job until August 1946, but was finally scrapped in 1947 after nearly 25 years of service.

Specification
Hosho
Displacement: 7,470 tons standard, 10,000 tons full load
Dimensions: length 168.1 m (551 ft 6 in); overall; beam 18.0 m (59 ft 0 in); draught 6.2 m (20 ft 4 in)
Machinery: 2-shaft geared steam turbines delivering 30,000 shp (22370 kW)
Speed: 25 knots
Armour: uncertain
Armament: (1941) eight twin 25-mm AA guns
Aircraft: (1942) 11 'Kate' torpedo-bombers
Complement: 550 officers and men



Hosho***, converted from an oiler, was commissioned as a carrier in 1922 following the visit of a British technical mission. Originally equipped with an island navigating bridge, within a year she was flush decked, and provided the Imperial Japanese Navy with valuable early experience in carrier operations.***

JAPAN

Akagi

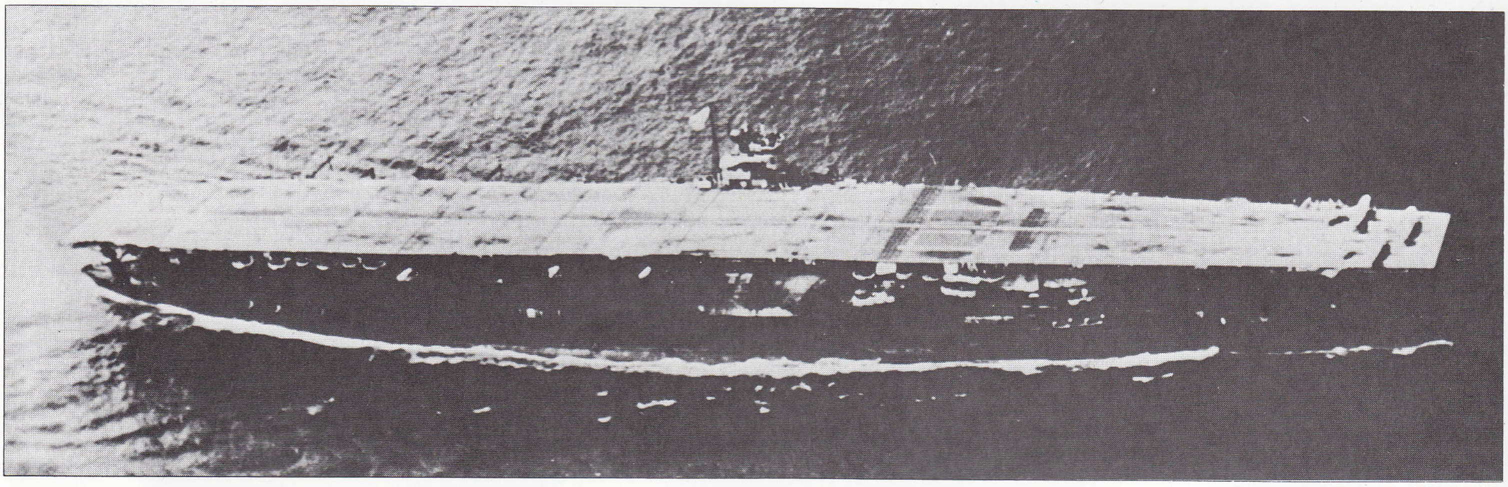
The outcome of the Washington Naval Disarmament Treaty left the Imperial Japanese Navy with several incomplete capital ships destined for the scrapyard. As the Americans and British had declared their intention of converting similar hulls into carriers, and in the light of successful experience with the *Hosho*, the naval staff decided to press ahead with two similar carrier conversions Two battle-cruisers, to be known as **Akagi** and *Amagi*, were chosen; these were projected as 40,000-ton ships capable of 30 knots. Work started in 1923 but the hull of the *Amagi* was badly damaged during the great Tokyo earthquake in September, and she was scrapped.

The *Akagi* was completed in March 1927, a flush-decked ship with two funnels at the starboard edge of the flight deck, a triple flight deck forward, and 10 200-mm (7.9-in) guns, six of them in old-fashioned casemates low down aft. Ten years later she was completely rebuilt, with a small island superstructure on the port side, and a full-length flight deck. It was hoped that the port-side island would simplify operations when operating in company with other carriers (allowing her aircraft to be marshalled separately) but it caused far more landing accidents than a starboard island.

With her half-sister *Kaga* she formed Carrier Division 1 and as Vice Admiral Nagumo's flagship led the attack on Pearl Harbor. She then led the other carriers on a brilliant series of raids through the East Indies and Indian Ocean, the force sinking the British carrier *Hermes*, driving the Allies out of Java and Sumatra and even getting as far as Darwin in northern Australia.

At the Battle of Midway on 4 June 1942 *Akagi*'s air group attacked Midway itself, and she suffered slight damage when a shore-based torpedo-bomber bounced off the deck early in the morning. At 10.22 she was attacked by aircraft from the USS *Enterprise*, which hit her twice with bombs. A 1,000-lb (454-kg) bomb burst in the hangar and started a fire among torpedo-warheads which spread to aviation fuel spilling from fractured lines; a second bomb (of 500 lb/227 kg) also started a fire among aircraft parked on the flight deck. Within 30 minutes the fire was out of control and Nagumo had shifted his flag to a light cruiser. The *Akagi* was abandoned but burned for another 9 hours or more. After vain efforts to board her the order was given to a destroyer to torpedo her.

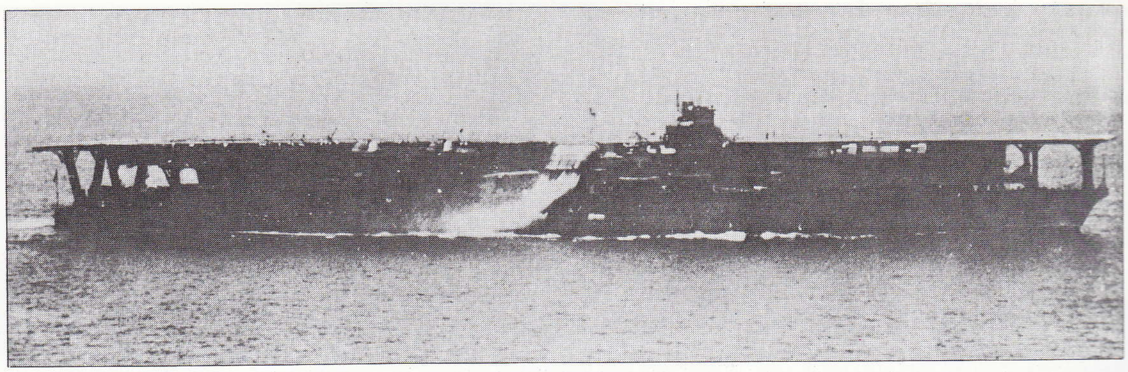
Specification
Akagi
Displacement: (1941) 36,500 tons standard, 42,000 tons full load
Dimensions: length 260.6 m (855 ft 0 in) overall; beam 31.3 m (102 ft 8 in); draught 8.6 m (28 ft 3 in)
Machinery: 4-shaft geared steam turbines delivering 133,000 shp (99180 kW)
Speed: 31 knots
Armour: uncertain
Armament: six 200-mm (7.9-in), six twin 120-mm (4.7-in) AA, and 14 twin 25-mm AA guns
Aircraft: (June 1942) 21 Mitsubishi A6M Zero fighters, 21 Aichi D3A 'Val' dive-bombers and 21 Nakajima B5N 'Kate' torpedo-bombers
Complement: 1,340 officers and men



Akagi ***at sea, a few months prior to Pearl Harbor. The left-hand island is noteworthy, as she was designed to operate in tandem with*** **Kaga*****. With an operational aircraft complement of 70 or more,*** **Akagi** ***was a considerable advance on*** **Hosho.**

JAPAN

Kaga



Kaga ***in wartime configuration; a maximum of 90 aircraft could be carried, but 81 was a more normal complement.*** **Kaga** ***was sunk by Douglas SBD Dauntlesses from USS*** **Enterprise.**

The Japanese battleship ***Kaga*** was laid down in 1918 and launched in November 1921, but as a result of the Washington Naval Disarmament Treaty of 1922 was scheduled to be scrapped. In September 1923, however, the Tokyo earthquake caused severe damage to the battle-cruiser *Amagi*, which was about to start her conversion to an aircraft-carrier, and the hull of the slightly smaller *Kaga* was substituted. The 4½-year conversion produced a carrier similar to the original *Akagi* conversion, with a flush deck and two short 'flying-off' decks forward. But unlike *Akagi* she had her smoke-ducts trunked on the starboard side. She was not an unqualified success, and was not operational until two years of trials had been conducted, and only four years after that, in 1934, she was taken in hand for modernization.

In her new guise she was considerably better, with more aircraft (90 instead of 60) and a small 'island' superstructure. However, unlike Western carriers, she still had a large downward-angled funnel below the edge of the flight deck. As displacement had gone up by 9,000 tons (standard) more powerful machinery had to be installed, with endurance to match, and many of the original faults were eliminated.

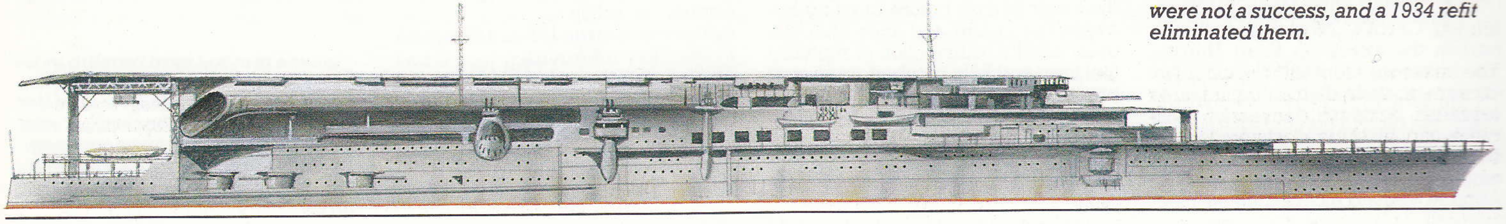
The *Kaga* was one of the six carriers which attacked Pearl Harbor on 7 December 1941, and she launched 27 Nakajima B5N 'Kate' torpedo-bombers, followed by 18 Mitsubishi A6M Zeros and 26 Aichi D3A 'Val' dive-bombers. She and the *Akagi* (Carrier Division 1) then took part in the devastating series of strikes in the East Indies, South Pacific and Indian Ocean which destroyed Allied military power in the first half of 1942.

At Midway on 4 June 1942, two hours after beating off American attacks successfully, *Kaga* was hit by four bombs from Douglas SBD Dauntless dive-bombers from the USS *Enterprise*, and near-missed by five more. Blast fractured fuel lines, feeding fuel to the fires already started among the aircraft waiting, fully armed and fuelled. Within 30 minutes the 38,000-ton carrier had to be abandoned, though she continued to burn for another 9 hours. At dusk the flames reached a magazine, and she blew up and sank quickly. Over 800 men went down with her, many trapped by the fires and others killed by the blast of the original explosions.

Specification

Kaga

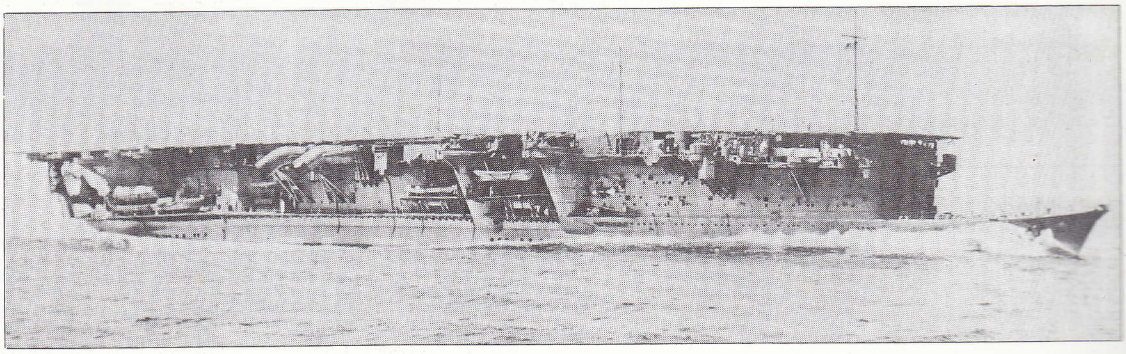
Displacement: (1941) 38,200 tons standard, 43,650 tons full load
Dimensions: length 247.6 m (812 ft 4 in) overall; beam 32.5 m (106 ft 7 in) over flight deck; draught 9.5 m (31 ft 2 in)
Machinery: 4-shaft geared steam turbines delivering 127,400 shp (95020 kW)
Speed: 28⅓ knots
Armour: uncertain
Armament: 10 200-mm (7.9-in), 16 127-mm (5-in) AA and eight twin 25-mm AA guns
Aircraft: 90 fighters, dive-bombers and torpedo-bombers
Complement: 2,016 officers and men



Kaga ***was completed in 1928 with a flush deck and two short 'flying off' decks forward of each hangar. These were not a success, and a 1934 refit eliminated them.***

JAPAN

Ryujo



An attempt to build as much as possible into limited tonnage, **Ryujo** ***was not a popular ship. The double hangar made her top heavy, her flight deck was too small, and she carried too few aircraft to be an effective fleet carrier.***

Under the Washington Treaty Japan was limited to 80,000 tons of carriers, but as the treaty exempted vessels under 10,000 tons the naval staff thought that it was worth trying to build an extra carrier inside the limit. The initial design was for an 8,000-ton ship carrying 24 aircraft, but the staff then insisted on adding a second hangar to double the aircraft capacity. This pushed the standard displacement 150 tons over the limit, but nothing was said to Japan's fellow-signatories – the first significant cheating by Japan, but not the last. Even with the illicit extra tonnage the new carrier, called ***Ryujo***, was top-heavy when she was completed in 1933. She was twice rebuilt, with bulges added, some guns removed and the forecastle raised, but the true displacement was now nearer 12,000 tons.

As may be imagined, the *Ryujo* was not popular in the fleet. Quite apart from her topweight problems, her flight deck was too small and she carried too few aircraft to be effective; she took longer than other carriers to launch and recover aircraft, because of congestion on the deck. However, the experience was put to use in designing the *Hiryu* and *Shokaku* classes.

The *Ryujo* was not part of the main carrier force which attacked Pearl Harbor, but supported the amphibious landings in the Philippines. In April 1942 she attacked Allied merchant shipping and two months later she joined in operations against the Aleutian Islands, but her only major action was the Battle of the Eastern Solomons. The *Ryujo* was chosen to spearhead an operation to reinforce the defenders of Guadalcanal, and with an escort of a heavy cruiser and two destroyers, was to lure the Americans away from the main force. It worked well, for at 09.05 on 24 August 1942 she was spotted from the air, but other search planes also located the *Shokaku* and *Zuikaku*. *Ryujo* was heavily attacked by aircraft from the *Enterprise* and *Saratoga* in the afternoon. In a brilliant attack dive-bombers and five torpedo-bombers smothered the carrier, scoring an estimated 10 bomb hits and two torpedo hits and escaping without casualties. Japanese records say that only one torpedo hit the carrier, but that was enough to set her on fire from end to end. Her rudder was also jammed, and the doomed ship was unable to steam or steer. Only 300 survivors left the ship, including Captain Kato, and she sank about four hours later.

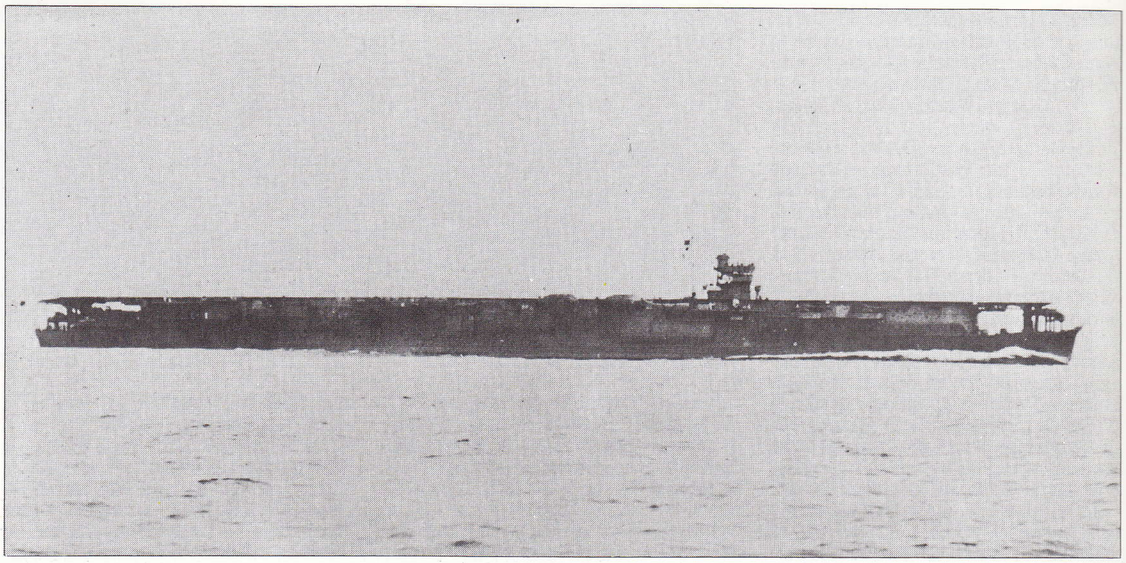
Specification

Ryujo

Displacement: 10,600 tons standard, 14,000 tons full load
Dimensions: length 180.0 m (590 ft 6 in) overall; beam 20.8 m (68 ft 3 in); draught 7.1 m (23 ft 4 in)
Machinery: 2-shaft geared steam turbines delivering 65,000 shp (48470 kW)
Speed: 29 knots
Armour: uncertain
Armament: four twin 127-mm (5-in) AA and 12 twin 25-mm AA guns
Aircraft: 24 Mitsubishi A6M Zero fighters and 12 bombers
Complement: 924 officers and men

JAPAN

Soryu



Pictured on sea trials in January 1938, Soryu *served as a model for most succeeding Japanese carrier designs. Fast, but lightly built, she carried a large complement of aircraft but was not built to take punishment. She was sunk by aircraft from USS* Yorktown.

With the experience gained from two large carriers and one small, as well as the little *Hosho*, the Imperial Japanese Navy staff felt confident that they could draw up a standard design for future carriers. Under the Second Reinforcement Programme of 1934 the first of this new series, the ***Soryu,*** was laid down in that year, and she went to sea at the end of 1937. The designers were still constrained by the Washington interntional disarmament treaties, however, and after subtracting the overweight *Ryujo* there was only a total of 20,000 tons left. The new carrier was accordingly notified as a 16,000-tonner although displacing some 2,000 tons more; the problem of how to accommodate a second carrier was solved by notifying the other signatories that Japan would be withdrawing from all treaty obligations after December 1936.

The *Soryu* was given a starboard island, but as in earlier carriers smoke was discharged through a pair of downward-curved funnels below the edge of the flight deck. A hull-form similar to that of a cruiser was chosen for high speed, and protection was sacrificed in favour of aircraft capacity. However, the excessively long but low hull resulted in very low clearance in the two hangars: 4.6 m/15 ft in the upper and 4.25 m/14 ft in the lower hangar. Three centreline lifts served these hangars, and 63 aircraft could be stowed.

With her half sister *Hiryu*, the *Soryu* formed Carrier Division 2 and took part in the attack on Pearl Harbor. Thereafter she went with the other fast carriers on their six-month mission to establish Japanese dominance over the Pacific. Her aircraft attacked Wake Island, the Dutch East Indies, Darwin and Ceylon, and she was part of Admiral Yamamoto's Combined Fleet sent to capture Midway Island early in June 1942.

At 10.26 on 4 June, 17 Douglas SBD Dauntless dive-bombers from the USS *Yorktown* attacked the *Soryu*, scoring three hits down the centreline of the flight deck. The first 1,000-lb (454-kg) bomb burst in the top hangar and blew out the forward lift. The second burst among strike aircraft ranged on the flight deck, and the third penetrated to the lower hangar before bursting between the centre and after lifts. The usual deadly combination of ruptured fuel lines and fully bombed-up aircraft produced an inferno, and after only 20 minutes the *Soryu* had to be abandoned. The glowing hulk was still afloat for another eight hours, but at dusk her magazines blew up and she sank.

Specification

Soryu

Displacement: 15,900 tons standard, 19,800 tons full load

Dimensions: length 227.5 m (746 ft 6 in) overall; beam 21.3 m (69 ft 11 in); draught 7.6 m (25 ft 0 in)

Machinery: 4-shaft geared steam turbines delivering 152,000 shp (113350 kW)

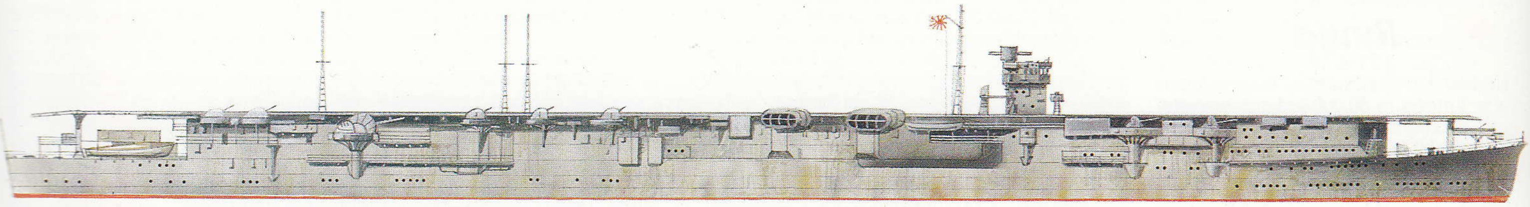
Speed: 34½ knots

Armour: uncertain

Armament: six twin 127-mm (5-in) and 14 twin 25-mm AA guns

Aircraft: 21 Mitsubishi A6M Zero fighters, 21 Aichi D3A 'Val' dive-bombers and 21 Nakajima B5N 'Kate' dive-bombers

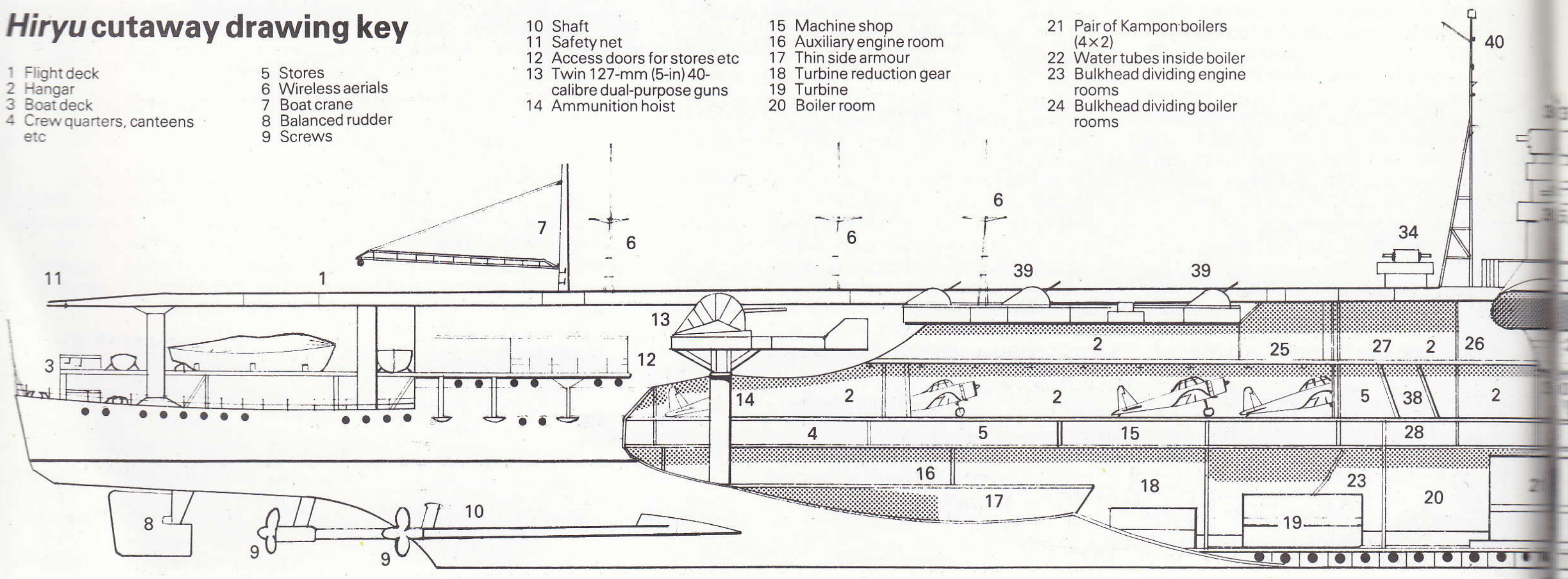
Complement: 1,100 officers and men



Soryu *was capable of making 34½ knots, and on a displacement of less than 20,000 tons embarked between 60 and 70 aircraft. As was common Japanese practice, the two funnels curved downwards from flight deck level.*

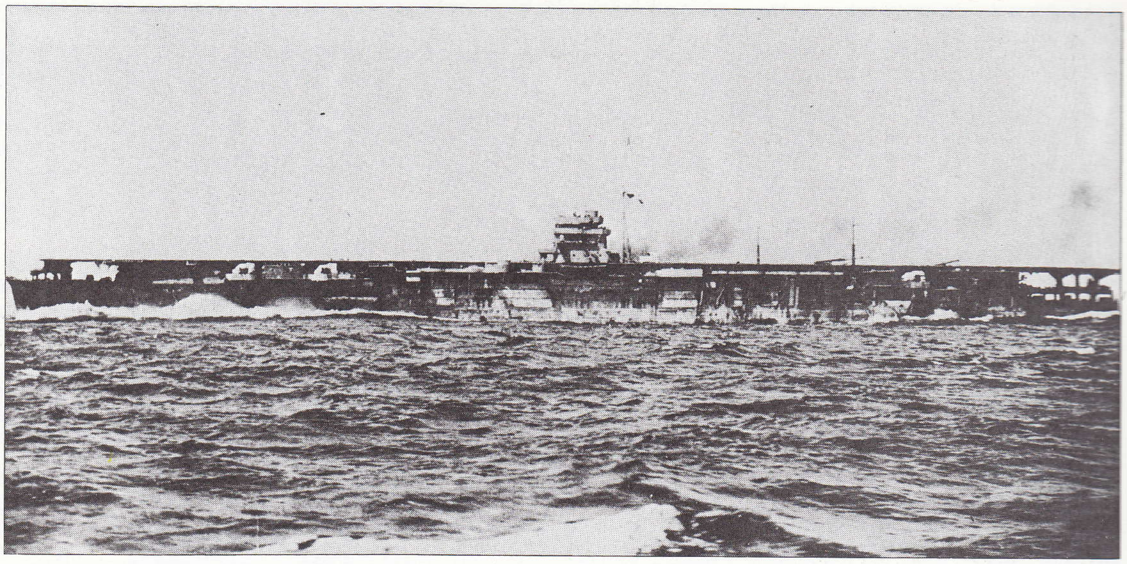
Hiryu cutaway drawing key

1 Flight deck
2 Hangar
3 Boat deck
4 Crew quarters, canteens etc
5 Stores
6 Wireless aerials
7 Boat crane
8 Balanced rudder
9 Screws
10 Shaft
11 Safety net
12 Access doors for stores etc
13 Twin 127-mm (5-in) 40-calibre dual-purpose guns
14 Ammunition hoist
15 Machine shop
16 Auxiliary engine room
17 Thin side armour
18 Turbine reduction gear
19 Turbine
20 Boiler room
21 Pair of Kampon boilers (4×2)
22 Water tubes inside boiler
23 Bulkhead dividing engine rooms
24 Bulkhead dividing boiler rooms



JAPAN

Hiryu



Seen on trials off Tateyama in April 1939,* Hiryu *was an improved* Soryu *design with increased endurance. She had a port-side island, designed to allow simultaneous side-by-side air operations with a conventional carrier. The idea was not a success.

The unhappy experience with the *Ryujo* and knowledge gained during the building of the *Soryu* led to major changes in the second carrier built under the Second Reinforcement Programme. The size of hangar and the machinery remained the same, but the hull was widened and endurance was increased by nearly 3,000 miles (4800 km). The worst feature was a small port-side island, for like the *Akagi* it was hoped that she could pair with a 'normal' carrier (in this case the *Soryu*) to provide a right-hand clockwise landing circuit. In practice the enlarged bridge caused such severe turbulence that the ***Hiryu*** suffered many more deck-accidents than her 'normal' half-sister *Soryu*, and the idea was finally abandoned thereafter. Apart from these defects, the protection was much lighter than in contemporary Western carriers, and there was no flush-fitting catapult available to launch the next generation of heavy aircraft. Apart from these drawbacks she compared well with other nations' carriers.

Throughout her active life the *Hiryu* served with the *Soryu* in Carrier Division 2 of the 1st Air Fleet. At Pearl Harbor she launched 18 Nakajima B5N 'Kate' torpedo-bombers and nine Mitsubishi A6M Zero fighters in the first strike, followed by 18 Aichi D3A 'Val' dive-bombers and more Zeros in the second strike, losing five aircraft in all. CarDiv 2 then went to Wake Island and helped to destroy resistance by the garrison. From the Palau Islands in January 1942 they covered the invasion of the Moluccas, as a prelude to the conquest of the East Indies.

After operations in the Indian Ocean the two carriers refitted and re-equipped for the Midway campaign. On 4 June *Hiryu* launched 18 'Kate' torpedo-bombers and nine Zeros for a dawn strike on Midway, losing eight 'Kates' and two Zeros. While this attack was in progress US Marine Corps dive-bombers attacked the carrier, and a near-miss caused considerable casualties. The *Hiryu* was not discovered by the strike which hit the *Akagi*, *Kaga* and *Soryu*, and about an hour after that her 18 'Val' aircraft scored three devastating hits on the USS *Yorktown*.

Late in the afternoon 24 dive-bombers from the *Enterprise* took *Hiryu* completely by surprise and dropped four bombs down the centre-line of her flight deck. The fires quickly got out of control, although the ship could still steam at 28 knots. She burned for another 6 hours, but the order to abandon ship was finally given, and a destroyer tried to sink her with a torpedo. The ship remained afloat for another 12 hours, but finally sank next day with the loss of 416 men.

Specification

Hiryu

Displacement: 17,300 tons standard, 21,900 tons full load

Dimensions: length 227.4 m (746 ft 0 in) overall; beam 22.3 m (73 ft 2 in); draught 7.8 m (25 ft 7 in)

Machinery: 4-shaft geared steam turbines delivering 152,000 shp (113350 kW)

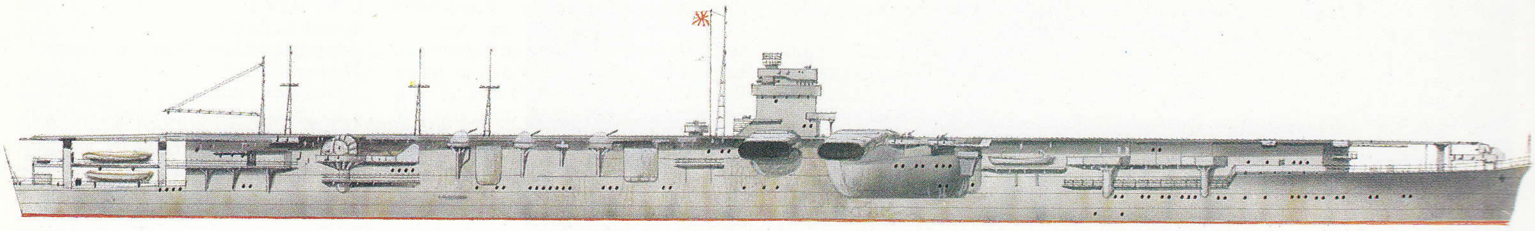
Speed: 34.4 knots

Armour: uncertain

Armament: six twin 127-mm (5-in), seven triple 25-mm AA and five twin 25-mm AA guns

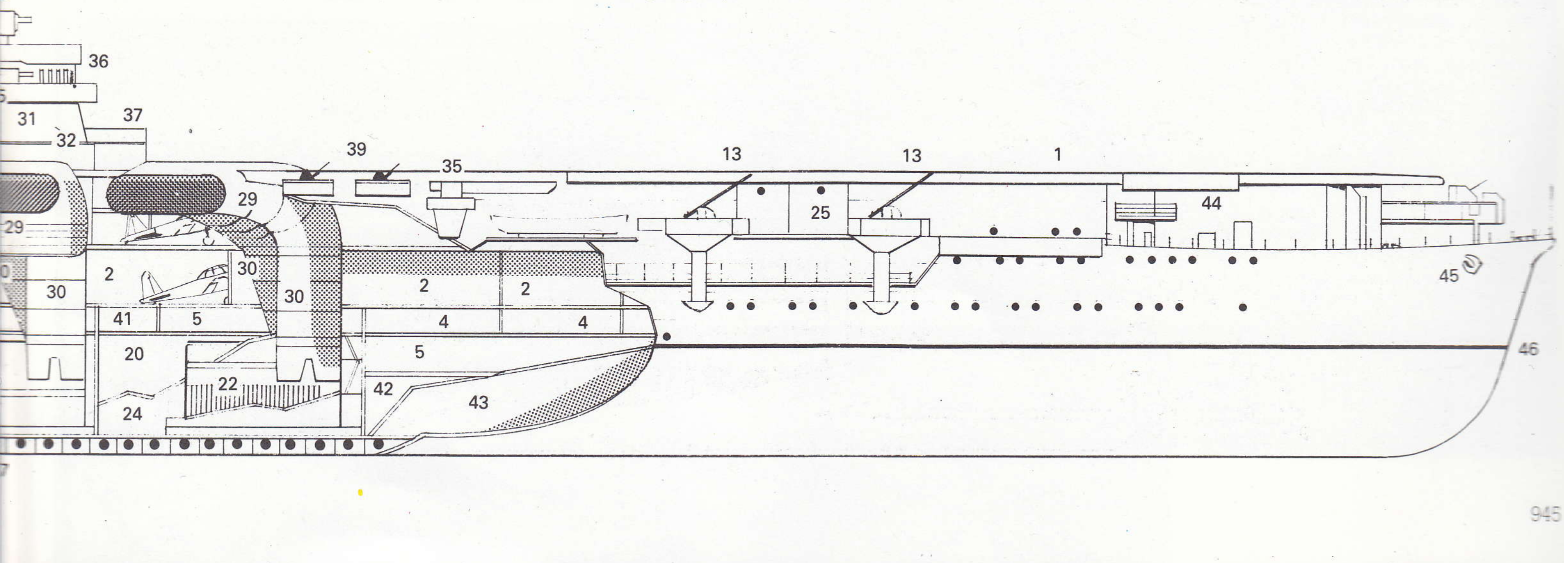
Aircraft: 64 aircraft

Complement: 1,100 officers and men



Hiryu differed from* Soryu *in having an increased beam to allow more bunkerage (giving an extra 4828 km/ 3,000 miles in endurance), an increased level of protection and a higher (by one deck) forecastle in the interests of seaworthiness.

25 Ventilating doors to hangar
26 Fire screen
27 Lift
28 Lift machinery
29 Funnel casing
30 Funnel uptake
31 Bridge
32 Command centre
33 Main rangefinder
34 Rangefinder for aft guns
35 AA gun rangefinder
36 Navigating bridge
37 Flight control bridge
38 Aircraft stores
39 25-mm AA guns
40 Mainmast
41 Officers' quarters/Offices
42 Aviation fuel
43 Fuel
44 Flight deck crew shelters
45 Anchor
46 Waterline
47 Double bottom



JAPAN

Shokaku

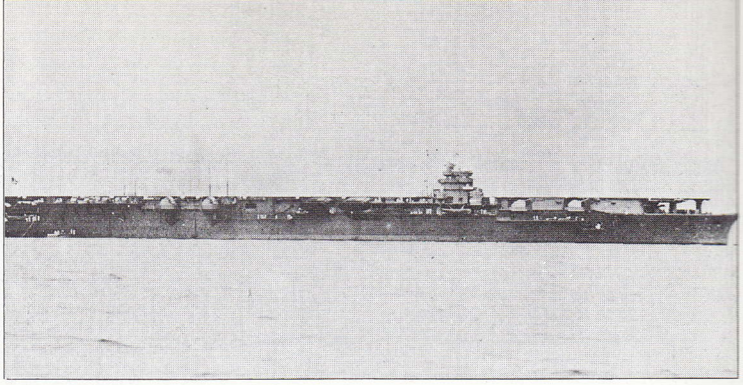
Japan's withdrawal from the international treaties limiting the size of warships at the end of 1936 enabled her constructors at last to design carriers that suited requirements. Under the 1937 Reinforcement Programme two more carriers were to be built, basically similar to the *Hiryu* but large enough to accommodate all that was required.

In the 'Shokaku' class all the earlier faults were remedied. Two catapults were provided, and a much larger hangar enabled aircraft capacity to be increased from 63 to 75. Even with a considerable increase in power (the most powerful machinery ever fitted in a Japanese warship) the two ships could achieve a range of nearly 10,000 miles (16000 km) as they carried 5,000 tons of fuel. Equally important, they were well armoured and carried a much heavier anti-aircraft armament than their predecessors. In most respects they were the best carriers in the world, being surpassed only by the later 'Essex' class, but like all Japanese carriers they suffered from vulnerable fuel systems. Not only were the fuel lines to the hangars and flight deck liable to be ruptured by explosions some distance away, but the fuel storage tanks were inadequately protected against shock.

Shokaku was begun at the end of 1937 and went to sea in August 1941, just two months before Pearl Harbor. Although she took part in the attack her aircrews were too inexperienced to do more than bomb the airfields on Oahu. With her sister *Zuikaku* she formed Carrier Division 5, and after their work-up early in 1942 they operated off Ceylon and New Guinea.

During the Battle of the Coral Sea *Shokaku* was damaged by a strike from the *Yorktown*; although she caught fire she was saved with some difficulty, and had to return to Japan for repairs. The worst casualties were, however, the loss of 86 aircraft and most of their aircrews, so that neither carrier could take part in the Battle of Midway. On 14 July they joined the new Carrier Division 1, with the light carrier *Zuiho*. In the Battle of the Eastern Solomons they damaged the *Enterprise* but again lost precious aircrew and aircraft. On 26 October the *Shokaku* was severely damaged by a dive-bomber strike from the *Hornet*.

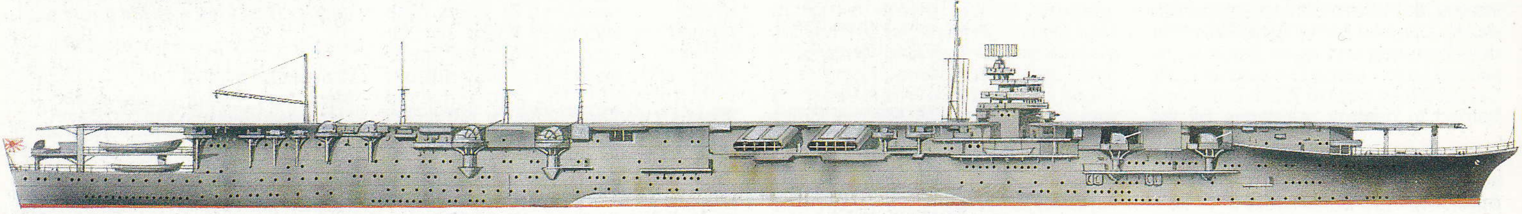
During the Battle of the Philippine Sea on 19 June 1944 she was hit by three torpedoes from the submarine USS *Cavalla*, and an explosion from ruptured aviation fuel tanks subsequently sank her.



Shokaku ***on acceptance trials in August 1941. In*** **Shokaku*****, the majority of faults of*** **Hiryu** ***and*** **Soryu** ***were rectified, although the aircraft capacity was similar. Speed remained above 34 knots, and protection was increased dramatically.***

Specification
Shokaku

Displacement: 25,675 tons standard, 32,000 tons full load
Dimensions: length 257.5 m (844 ft 9 in) overall; beam 26.0 m (85 ft 4 in); draught 8.9 m (29 ft 2 in)
Machinery: 4-shaft geared steam turbines delivering 160,000 shp (119310 kW)
Speed: 34.2 knots
Armour: belt 215 mm (8½ in); deck 170 mm (6¾ in)
Armament: eight twin 127-mm (5-in) dual-purpose and 12 triple 25-mm AA guns
Aircraft: 27 fighters, 27 dive-bombers and 18 torpedo-bombers
Complement: 1,660 officers and men



Probably the best carriers extant at the time of their introduction, the 'Shokakus' had a strong anti-aircraft armament, but suffered from the common Japanese vulnerability of the fuel systems. Indeed, a fuel explosion following torpedo damage sank Shokaku ***in June 1944.***

JAPAN

Zuikaku

Zuikaku, the second ship of the 'Shokaku' class, was laid down in May 1938 and entered service in September 1941. She joined her sister in Carrier Division 5, and for the next three years the two were inseparable. The inexperience of CarDiv 5's aircrews prevented the ships from having anything more than a supporting role during the Pearl Harbor attack, but they were fully worked up by the time CarDiv 5 began its destructive raids on the British in Ceylon. They then left the main carrier force and went to Truk, from where they covered the invasion of Port Moresby on 1 May 1942.

In the ensuing Battle of the Coral Sea CarDiv 5 scored a tactical victory by sinking the *Lexington*, in exchange for the light carrier *Shoho*. The Japanese carriers wasted their efforts on sinking a destroyer and a fleet oiler, which they misidentified as a cruiser and a carrier. A strike of 24 Nakajima B5N 'Kate' and 36 Aichi D3A 'Val' bombers failed to penetrate the US carriers' screen, but on 8 May a similar strike failed to find the *Zuikaku* in a rain squall. Although *Zuikaku* was undamaged her highly trained aircrew had suffered serious attrition, and she had to return to Japan with her damaged sister to retrain her air group. As a result CarDiv 5 missed the Battle of Midway, and in the month after Midway they were incorporated into a new CarDiv 1. In the following month they left for the Solomons to challenge American power in Guadalcanal, but so severe was the shortage that neither carrier had her full complement of aircraft embarked.

In the Battle of the Eastern Solomons on 24 August *Zuikaku* damaged the *Enterprise* but at the price of heavy losses. She escaped from the slaughter of the Philippine Sea Battle in June 1944 but as part of the reconstituted CarDiv 3 she was part of the forlorn hope which tried to lure the American fast carriers away from Leyte Gulf. They sailed on 20 October, and four days later *Zuikaku* launched her last air strike against the enemy. All were shot down, and next day the American pilots took their revenge by sinking all four Japanese carriers, in the Battle of Cape Engano. The *Zuikaku* was made the chief target, some 80 aircraft attacking her from all sides with bombs and torpedoes. She took an early hit from a torpedo and started to list heavily. A second wave of more than 100 aircraft attacked and hit with an estimated seven torpedoes and four bombs. No ship could withstand such damage, and she soon rolled over and sank.

Specification
Zuikaku

Displacement: 25,675 tons standard, 32,000 tons full load
Dimensions: length 257.5 m (844 ft 9 in) overall; beam 26.0 m (85 ft 4 in); draught 8.9 m (29 ft 2 in)
Machinery: 4-shaft geared steam turbines delivering 160,000 shp (119310 kW)
Speed: 34.2 knots
Armour: belt 215 mm (8½ in); deck 170 mm (6¾ in)
Armament: eight twin 127-mm (5-in) dual-purpose and 12 triple 25-mm AA guns
Aircraft: 27 fighters, 27 dive-bombers and 18 torpedo-bombers
Complement: 1,660 officers and men

Zuikaku ***lasted some four months longer than her sister, but was finally lost off Cape Engano during the Battle of Leyte Gulf. As the ship sank, crew members found positions to salute the naval ensign as it was lowered.***

Pearl Harbor

The morning of 7 December 1941 was a typical quiet Sunday for the US Pacific Fleet, with crews on weekend passes ashore and vessels at a low state of readiness. Such was the scene that met the eyes of the first of Admiral Nagumo's aircrews, flying from a carrier force over the horizon. Their target was Pearl Harbor.

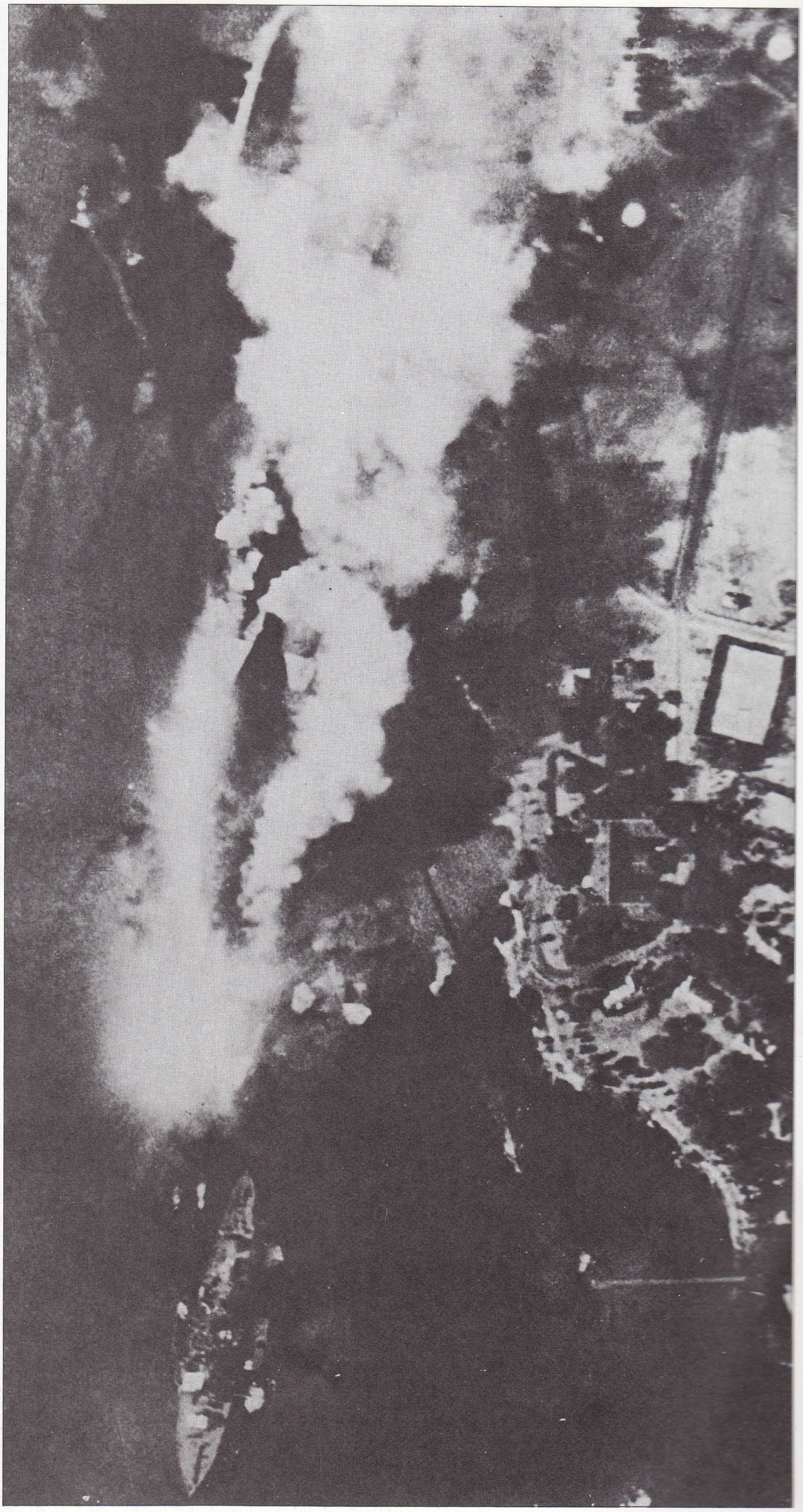
Japan's adventures on the Asian mainland during the 1930s stirred great antagonisms in the Western world. One result was a build-up of the American fleet and, though this was matched by the Japanese, the latter lacked the oil resources to use it in a prolonged war. Japan, indeed, lacked most natural resources and felt in addition the need for what, elsewhere, would be called *Lebensraum* (living room). Finally, when the European war had brought about the capitulation of France, Japan saw her opportunity and invaded French Indo-China. Well understanding the Japanese weakness, the West embargoed her oil supplies in retaliation.

To the Japanese there could now be no going back without unacceptable loss of prestige. Europe was virtually a German vassalage; of the major Far Eastern colonial powers, the Netherlands had fallen like France and the defeat of the UK appeared only a matter of time. A short but intense war could gain Japan what she needed, namely Malaya, the Philippines, the East Indies and a defensive perimeter of outlying islands. Only the American fleet was really to be feared and a massive riposte from this source could be prevented by an effective pre-emptive strike on Pearl Harbor, its Hawaiian base. It was argued that the Americans, though incensed, would be faced with both a *fait accompli* and a two-ocean war, and would be driven by its strong isolationist lobbies to accept the situation.

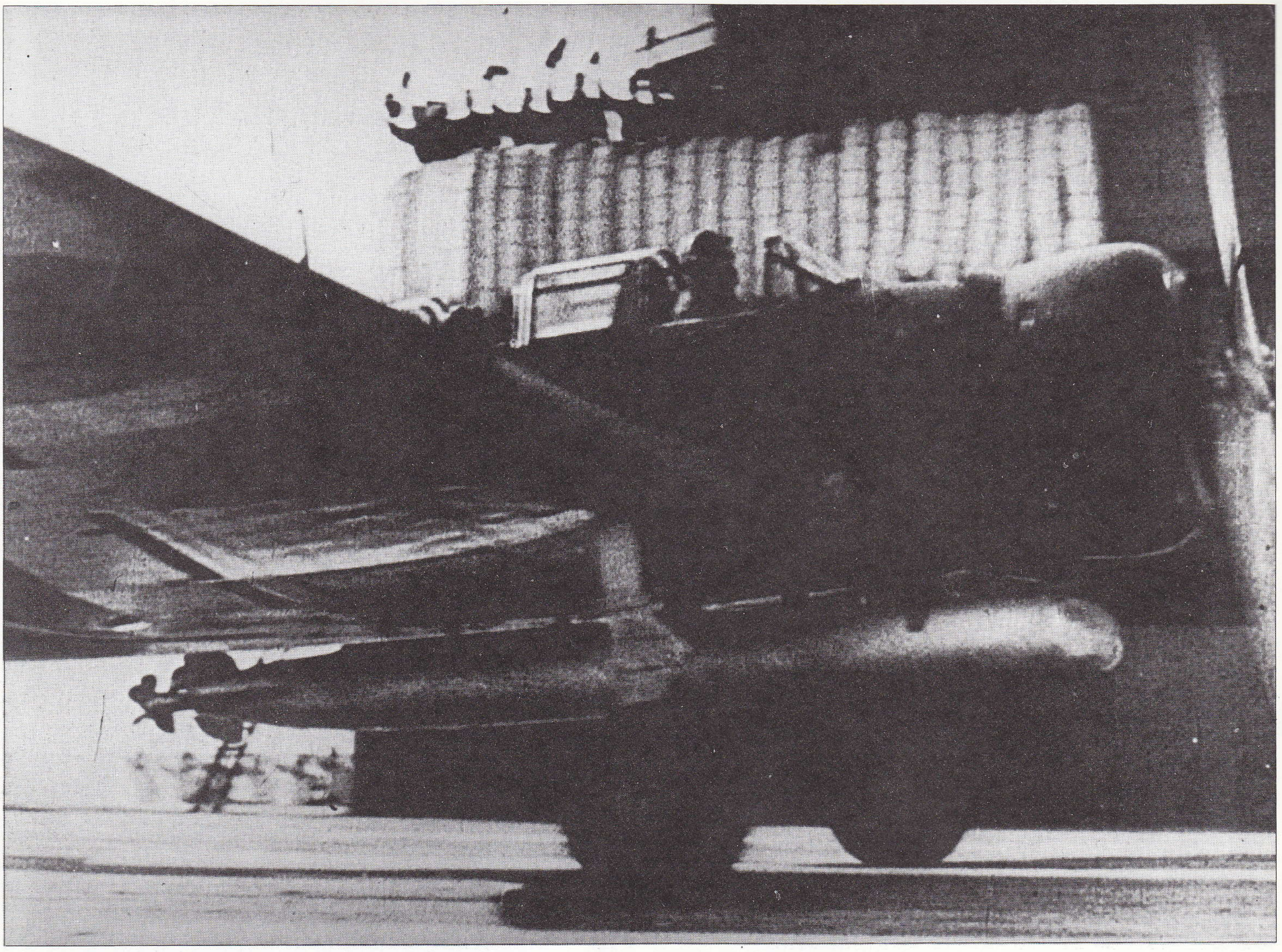
Once decided, the Japanese planned thoroughly. That part of the US Pacific Fleet forward-based at Pearl Harbor was in a slack peacetime routine despite world tensions yet, even so, presented a formidable target. A conventional gunned fleet could never have undertaken the job, only the power of a modern carrier group making it possible, and then only if concentrated on a previously undreamt scale.

The possibilities of carrier-based air assault on a defended naval base had been demonstrated in the British raid on Taranto in November 1940, and the precedent for a Japanese pre-emptive naval attack had been made in February 1905 at Port Arthur.

Pearl Harbor's geography was well known, and the Japanese exercised to perfect their tactics for months beforehand. Only aircraft were to be used, which meant bomb and torpedo attack. Suitable armour-piercing bombs were not available, so fins were added to 356-mm (14-in) naval shells to produce 800-kg (1,764-lb) projectiles that proved highly effective. The standard 400-mm (15.75-in) aerial tor-



To the Japanese pilots, the sight of so many powerful vessels wrecked and burning could only signify a mighty victory. Indeed, the US Pacific Fleet had suffered a crushing blow, but fortunately the all-important carriers were not at Pearl Harbor, and escaped damage.



Dawn on 7 December, and a Nakajima B5N 'Kate' torpedo-bomber takes off from* Hiryu. *The attack was timed to cause maximum confusion, with the first waves over target when the Americans were having breakfast.

pedo was of low lethality against major targets, so large numbers would be used to guarantee a sufficient percentage of hits. As the harbour was shallow, frangible wooden fins were added to the torpedoes to prevent an initial dive into the muddy seabed.

Although the Imperial Japanese Navy was deeply committed with the numerous simultaneous undertakings that were planned, the importance of the Pearl Harbor operation was emphasized by the allocation to it of the fleet's six best carriers. Under the command of Vice Admiral Nagumo, the force was termed the 1st Air Fleet; the *Akagi* was its flagship and was accompanied by *Kaga*, *Soryu*, *Hiryu*, *Shokaku* and *Zuikaku*, their normal aircraft outfits swollen to over 430 for the occasion. These were mainly Aichi D3A 'Val' dive-bombers, Nakajima B5N 'Kate' torpedo and level bombers, and Mitsubishi A6M 'Zeke' fighters. No surface action was planned or expected and, in any case, gunned warships were in short supply, so supporting forces included only two battleships, three cruisers (two of which were configured to carry five reconnaissance seaplanes apiece) and nine destroyers.

The force concentrated in great secrecy at an isolated and desolate anchorage in the Kuriles. As Hawaii was half an ocean distant and a circuitous route would need to be taken, the fleet was accompanied by tankers and supply ships. Although these would limit the speed of the group. this was not important before the event.

Sailing on 26 November 1941, the Japanese kept to a northern route, beset by concealing fog and poor weather. The track was well clear of trade routes and beyond the radius of Consolidated PBYs working out of Midway Island. Submarines had been sent ahead to reconnoitre.

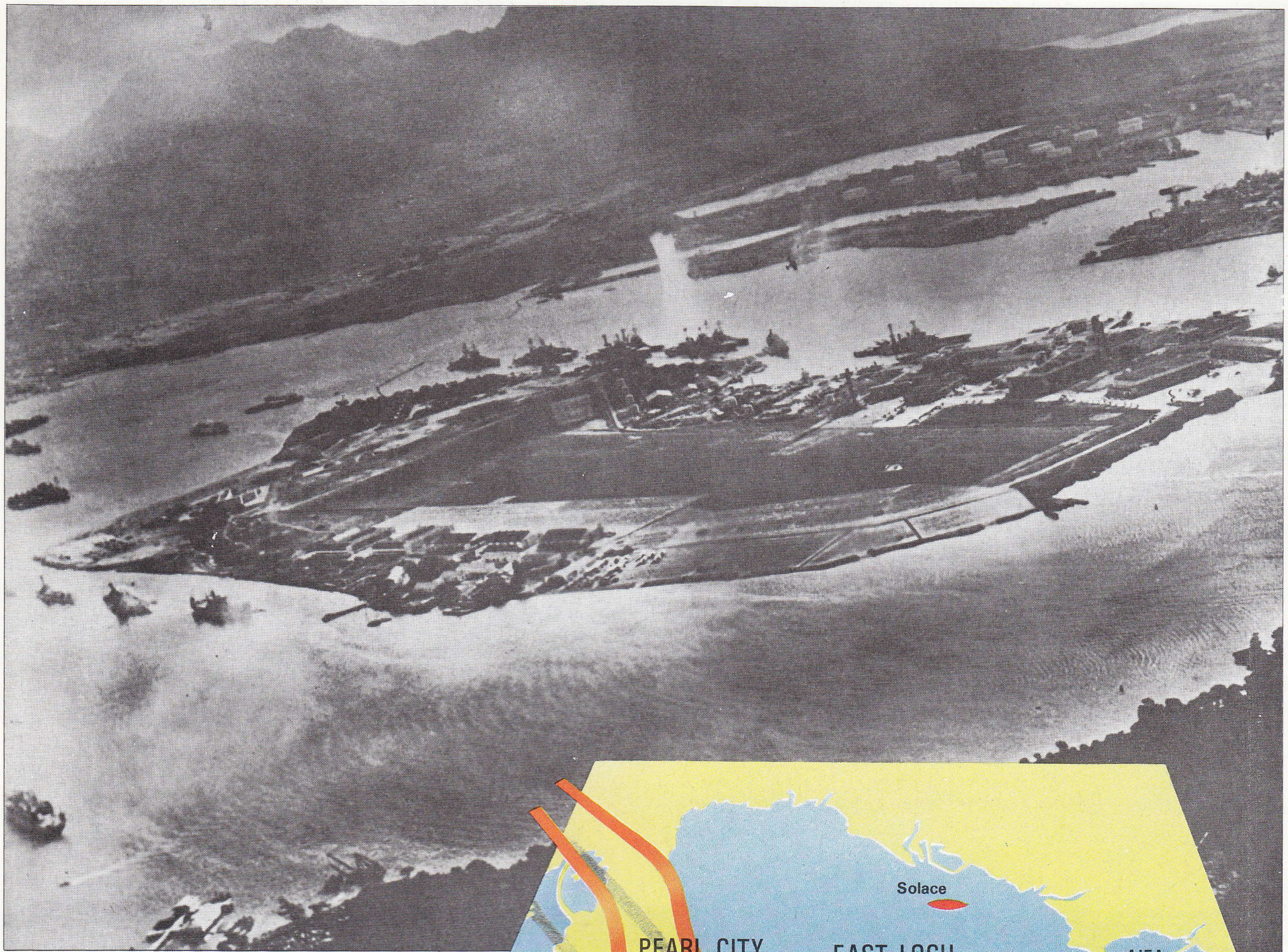
The attack is launched

The 'attack' order was received by Nagumo on 1 December and, two days later, far to the north west of Hawaii, his force refuelled from the support ships. Replete, unreported and unsuspected, the force worked up to 25 kts and began the run-in from the unlikely direction of north. For maximum effect, the strike was scheduled for breakfast time on Sunday 7 December. The evening before, Nagumo was given a final update on the American fleet in port and was disappointed to learn that no carriers were present. Japanese intelligence did not appear too good where these were concerned for, of the five they believed to be in the Pacific, two were in fact in the Atlantic. Of the remainder, the USS *Saratoga* was on the west coast and, as luck would have it, the two actually based on Pearl Harbor (the USS *Enterprise* and USS *Lexington*) were away delivering aircraft to Wake and Midway.

As the Japanese approached their launch point, 445 km (275 miles) north of Hawaii, however, they knew that targets still abounded in the form of eight battleships, eight cruisers, 29 destroyers and 40 other assorted warships and auxiliaries.

First aloft, in the pre-dawn gloom, were four Aichi E13A 'Jake' floatplanes from the cruisers, tasked with reconnoitring the track. Because of deteriorating weather conditions, the first strike began to get airborne before 0600. In 15 minutes 183 aircraft were flown off, marshalled and away, a considerable achievement for its day.

With its Saturday night still heavy upon it, the American fleet slumbered in the brilliant light of an early sun as the waves of aircraft bore in: 40 torpedo bombers, 51 dive-bombers, 49 bombers with large AP projectiles and 43 fighters for escort and ground support. A veritable armada by the standards of the day, the Japanese formations were detected by surveillance radar and reported. That the reports were not acted upon is a subject of debate to

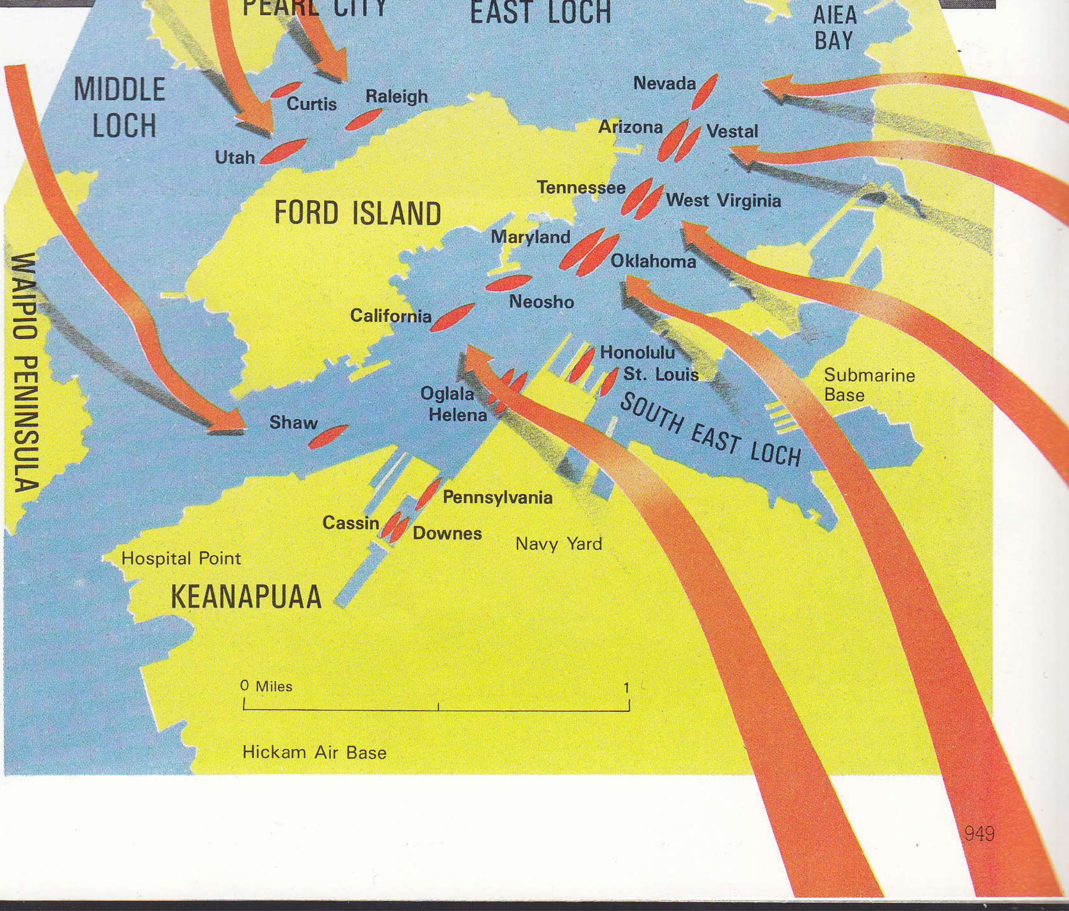


A Japanese photograph (above) of Ford Island early in the attack. A bomb or torpedo can be seen exploding just beyond USS Oklahoma *and* West Virginia. *The map (right) gives the locations of major units in Pearl Harbor on 7 December.*

this day; probably, as at Savo Island, yet to come, the reason was no more sinister than sheer disbelief born of acute unlikeliness.

Slightly early, at about 07.55, all hell broke loose about the heads of the Americans. At low states of readiness, with large numbers of crew ashore, the fleet found itself in a war in its own backyard. The Japanese formations split, with groups making for the various airfields on the island that, between them, could field over 400 aircraft. Suppression of these was vital to avoid instant retribution, and the tactic was savagely effective: on six airfields, nearly 200 aircraft were destroyed and 160 damaged in various degrees. Only a handful were able to take to the air.

The main drama, meanwhile, unfolded in the harbour. In the centre of this spacious inlet lay Ford island, off which was 'Battleship Row'. Seven battleships, together with auxiliaries, were moored singly and in pairs in a gleaming line. Though this represented an apparently unmissable target some 1200 m (1,315 yards) in length, only about 800 m (880 yards) separated the line from the opposite, or dockyard, shore.


Solace
PEARL CITY
EAST LOCH
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MIDDLE LOCH
Curtis
Raleigh
Utah
Nevada
Arizona
Vestal
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West Virginia
FORD ISLAND
Maryland
Oklahoma
Neosho
California
WAIPIO PENINSULA
Honolulu
St. Louis
Submarine Base
Oglala
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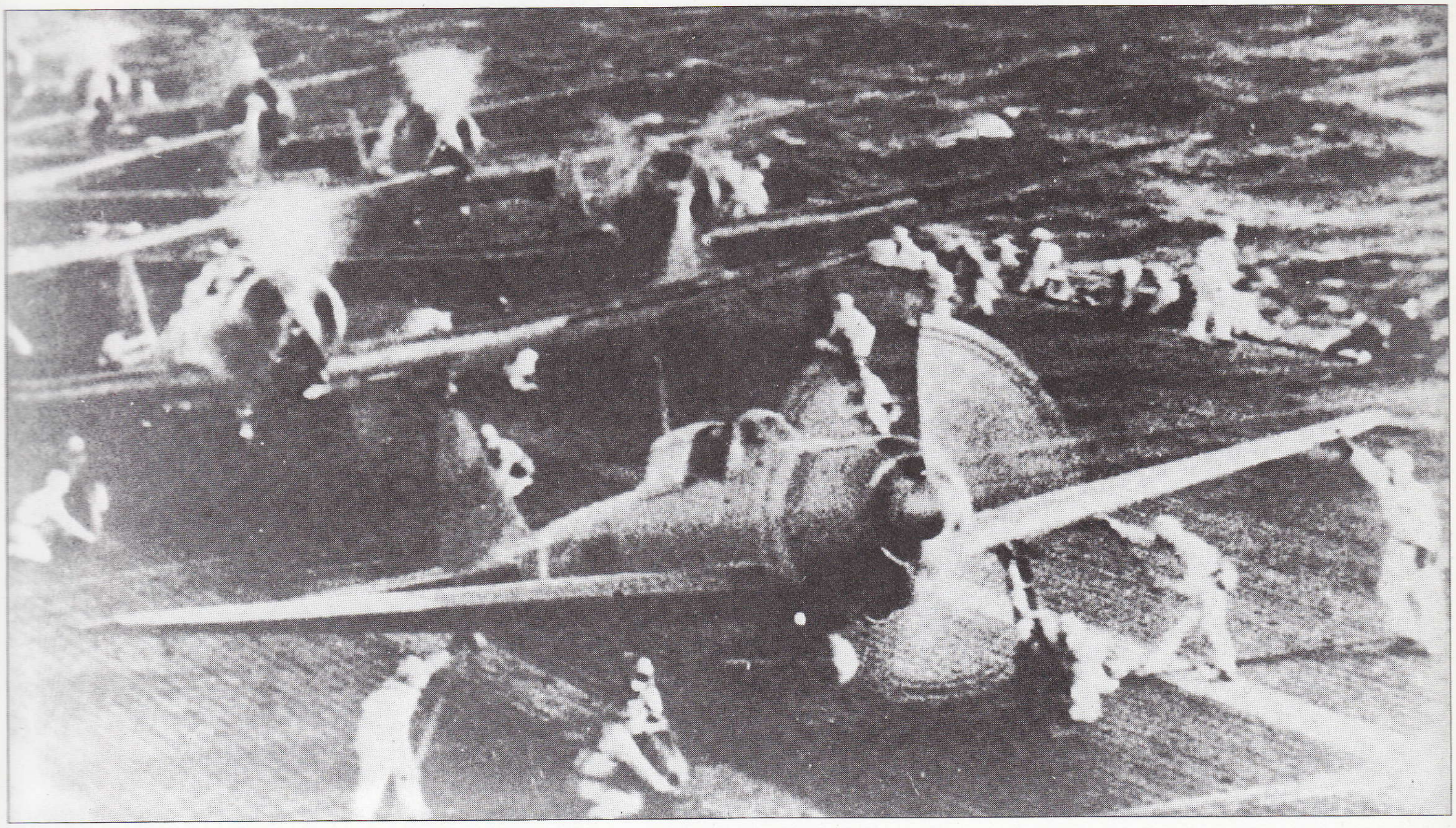
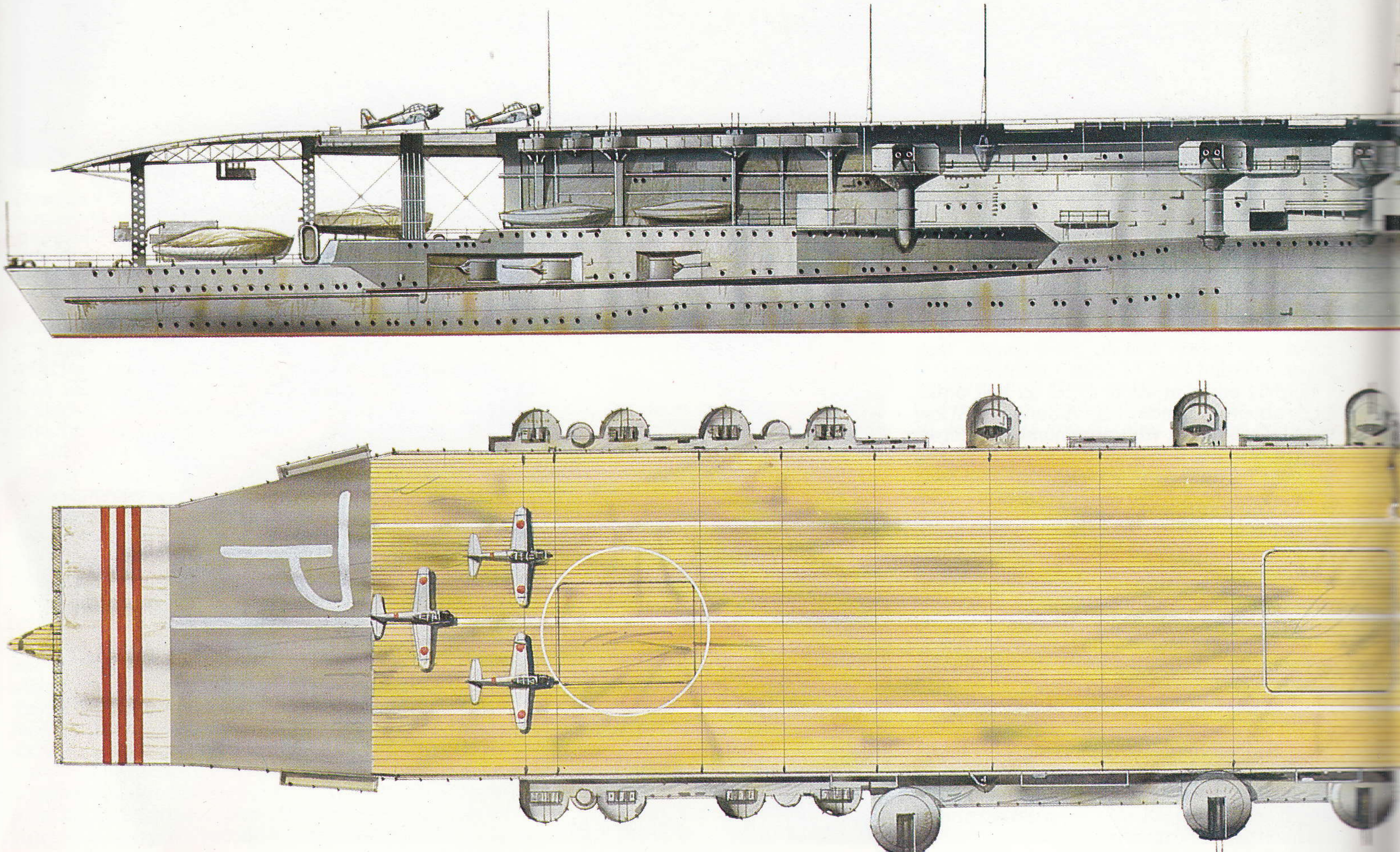
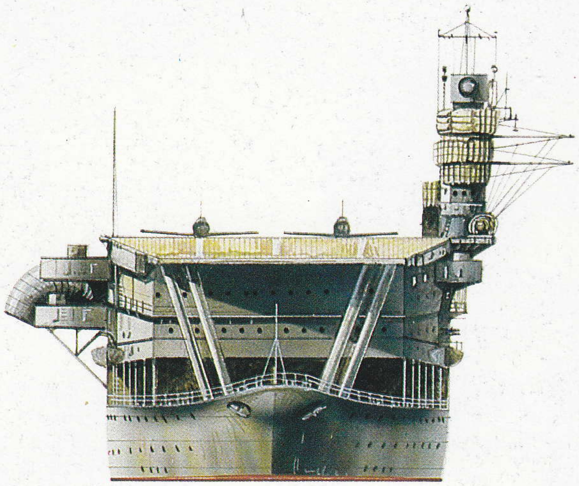
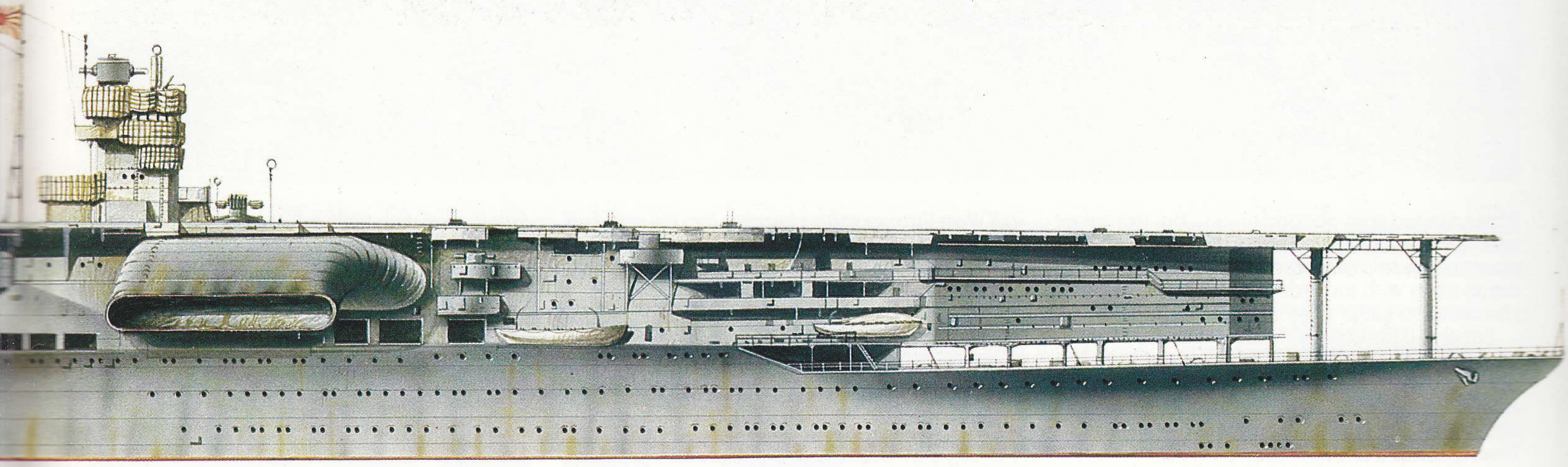


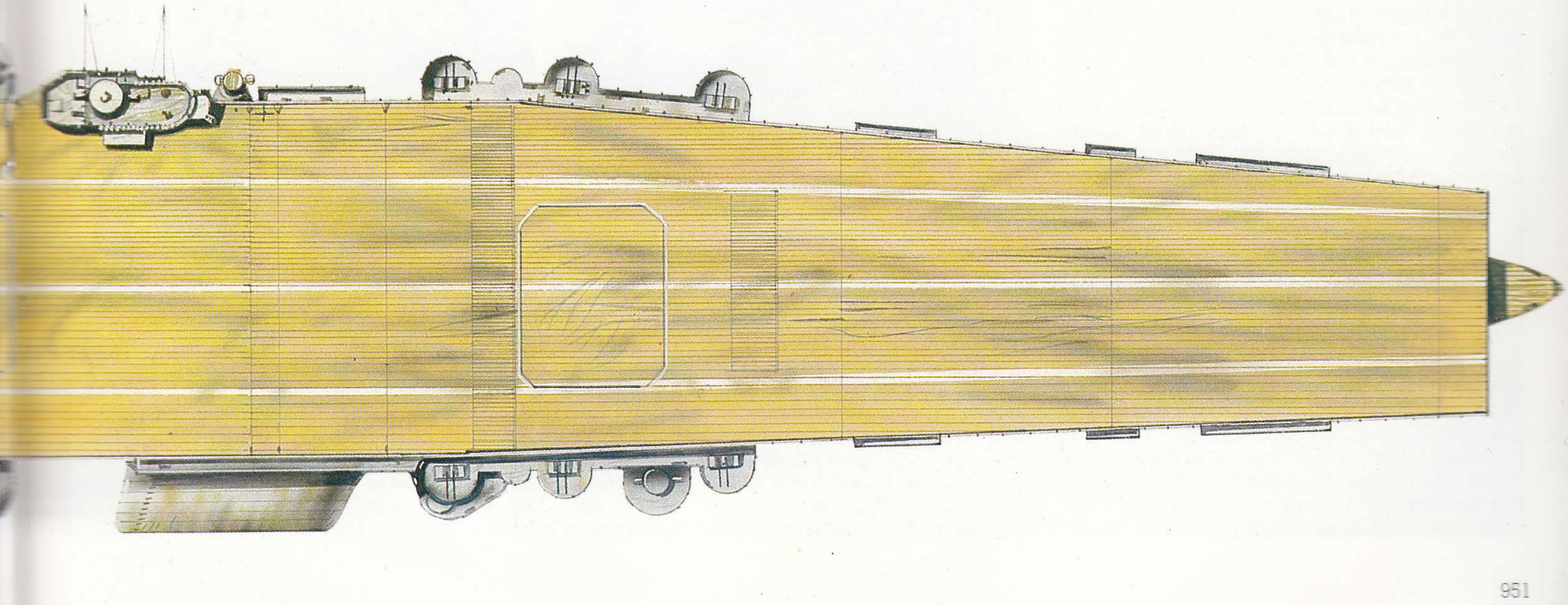


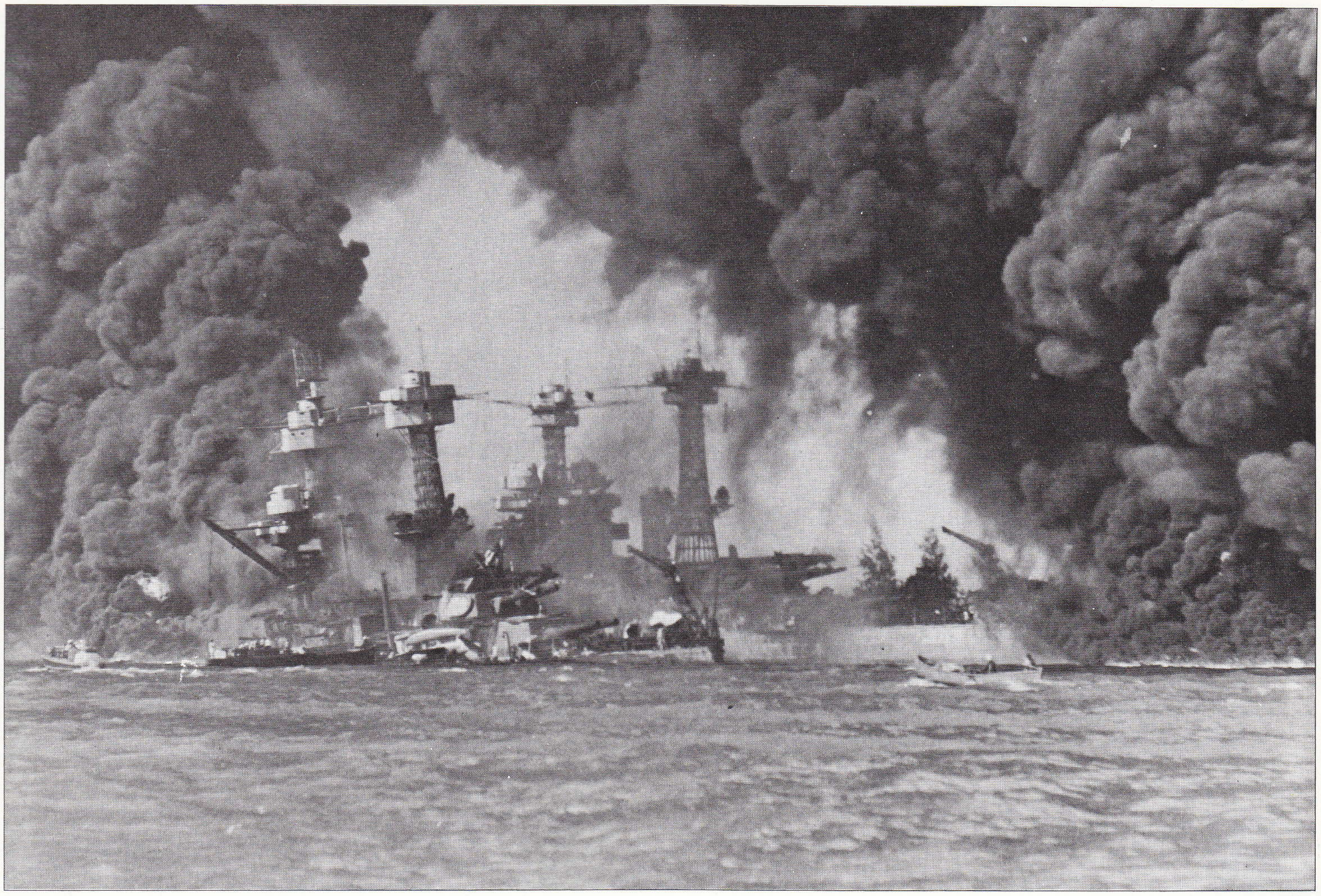
Left: Mitsubishi A6M2 Zero fighters warm up on the deck of a Japanese carrier prior to an escort mission over Pearl Harbor. A proportion of the first strike had the task of neutralizing any fighter opposition on the ground, but the Zeroes were added insurance.



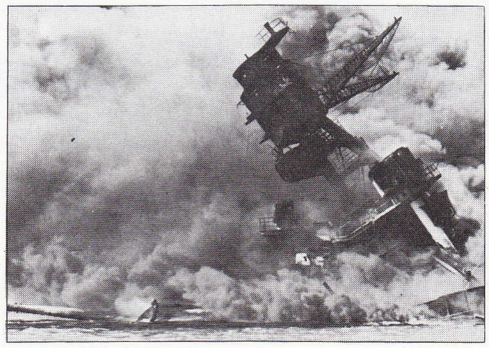
Akagi as she appeared in December 1941. Converted on the stocks from a projected 41,000-ton battle cruiser, Akagi was completed in 1927. Originally flush-decked, she had two smaller flying-off decks forward of her two hangar decks. After reconstruction in 1935-8, she emerged with an almost full-length flight deck and a small island. Note the sponson-mounted 203-mm (8-in) guns at the stern, a legacy of Akagi's origins as a World War I battlecruiser design, and the characteristic Japanese funnel arrangement. What was not typical was the port side island, designed to enable Akagi to operate in tandem with her half sister Kaga. The arrangement was not a success.







USS West Virginia *settles burning into the water off Ford Island, accompanied by USS* Tennessee. *Beyond them the doomed USS* Arizona *lies hidden in a pall of smoke, a magazine explosion having killed more than 1,000 sailors. Burning oil on the water threatens to swamp the small boats attempting rescue work.*



USS Arizona *suffered most in the attack, a forward magazine exploding to shatter the ship. Unlike many of the other damaged vessels, she was beyond repair, and remains in Pearl Harbor to this day as a memorial.*

USS West Virginia *amid an inferno is hardly visible. What is astonishing is that the vessel was raised, drastically rebuilt, and served with distinction in the later stages of the Pacific war. Similarly, USS* Nevada, Maryland, Tennessee *and* California *were restored.*

This entailed split-second timing, but the target was neither moving nor shooting, and the aviators were well practised. The water became alive with torpedo tracks and the muddy discoloured rings from bomb bursts.

Barely 10 minutes after the attack had begun came a heart-stopping moment as the USS *Arizona* erupted; hit by only one torpedo, her forward magazine had detonated on being drilled by one of the improvised AP bombs. Nearly 1,200 perished.

Just astern, the USS *West Virginia* absorbed six torpedoes and settled on the bottom, shielding in the process the USS *Tennessee* that lay on the inshore berth. The USS *California*, at the end of the trot, took two torpedoes and began to flood. Fuel oil from ruptured tanks blazed on the water and a pall of grey-black smoke formed the sombre backdrop to the activities of a growing number of small craft feverishly engaged in the task of rescue.

At the head of the line the USS *Nevada*, though hit, succeeded in getting under way; but even as the momentum of the first strike began to slacken, the second wave of 167 Japanese aircraft arrived.

The stricken *California*, hit twice more, settled to the level of her upper turrets while the gallant *Nevada* had to be beached. All, including the docked USS *Pennsylvania*, had also been hit by bombs and damaged in varying degrees. The defences were now better organized, preventing the second wave from causing the same execution.

By mid-day Nagumo had recovered his aircraft and had begun a high-speed withdrawal. For the loss of 29 aircraft he had both made history and set in train the process that was to devour his country. The old battleships, which only time would show to have been obsolescent, had absorbed the ordnance that would, more profitably, have laid waste the fleet base facilities. Worse, the American carrier and submarine forces remained intact and were to spearhead the great naval effort that, eventually was to bring about the Japanese downfall.

The Japanese gamble had failed. America did not flinch from war, and this war would not be the short affair anticipated by the Japanese. In a contest of attrition with the world's greatest industrial power there could only ever have been one result.

JAPAN

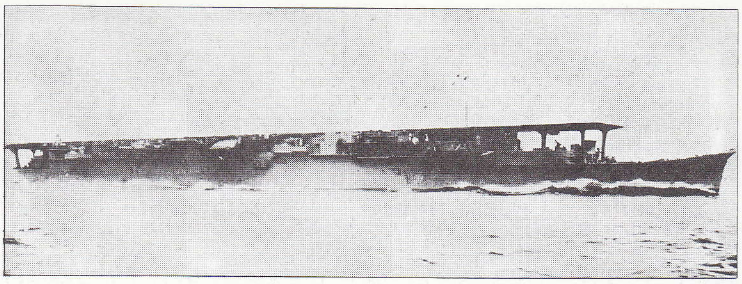
Zuiho

In a desperate attempt to remedy the shortage of aircraft-carriers, the Japanese naval staff decided that certain large fleet auxiliaries such as submarine tenders should be designed for rapid conversion to carriers in wartime. One such class was the 'Tsurigizaki' class of high-speed oilers, which were ordered under the 1934 Second Reinforcement Programme; their hulls were specially strengthened. The design was then altered to submarine tenders, and the lead-ship entered service in that role early in 1939. Her sister ship *Takasaki*, however, was not completed, and was laid up in the shipyard for nearly four years. Work on her conversion to a carrier started in January 1940, under the new name ***Zuiho***.

Apart from the replacement of the unreliable diesels with geared steam turbines, as much of the original hull was retained as possible. A single hangar was provided, accommodating a maximum of 30 aircraft, with two centreline lifts; there were two catapults but no island superstructure. To retain the high speed and endurance all planned armouring was deleted. The conversion was carried out in a year, and the *Zuiho* joined the Combined Fleet in January 1941. With the old *Hosho* (Carrier Division 3) she was sent to the Palaus in the late autumn of that year and took part in the attack on the Philippines. She then returned to Japan for repairs before taking part in the conquest of the East Indies in the spring.

Luckily for the carrier, she was with the Support Force at Midway, and escaped the destruction of the main carrier force. In the Battle of the Santa Cruz Islands she was part of Admiral Nagumo's Carrier Strike Force. At 07.40 on 25 October 1942 a dive-bomber from the USS *Enterprise* made a surprise attack out of low cloud, dropping its bomb in the centre of the flight deck. With a 50-ft (15-m) crater in her flight deck the *Zuiho* could no longer operate aircraft, and so after launching her aircraft the *Zuiho* returned to base.

In February 1944 *Zuiho* rejoined Carrier Division 3, and she took part in the Battle of the Philippine Sea, when her aircraft scored a hit on the battleship *South Dakota*. In the fighting around Leyte Gulf she was one of the doomed carriers which attempted to decoy the Americans: in the Battle of Cape Engano she was hit by two bombs on the flight deck and was near-missed six times. In spite of a serious fire and flooding she was under way for another 6 hours, as the other carriers were picked off. Finally it was her turn, and three waves of attackers finished her off.



Zuiho off Tateyama a year before Pearl Harbor. Part of the support force at Midway, she escaped destruction and went on to serve in the Solomons and the Philippine Sea before meeting her fate off Cape Engano at Leyte Gulf.

Specification

Zuiho

Displacement: 11,262 tons standard, 14,200 tons full load

Dimensions: length 204.8 m (672 ft 0 in) overall; beam 18.2 m (59 ft 8 in); draught 6.6 m (21 ft 8 in)

Machinery: 2-shaft geared steam turbines delivering 52,000 shp (38770 kW)

Speed: 28.2 knots

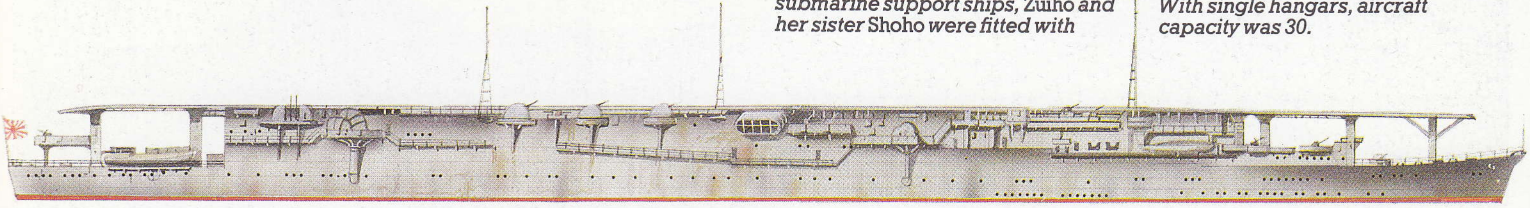
Armour: none

Armament: four twin 127-mm (5-in) dual-purpose and four twin 25-mm AA guns

Aircraft: 30

Complement: 785 officers and men

Originally diesel-powered submarine support ships, Zuiho and her sister Shoho were fitted with steam turbines during conversion. With single hangars, aircraft capacity was 30.



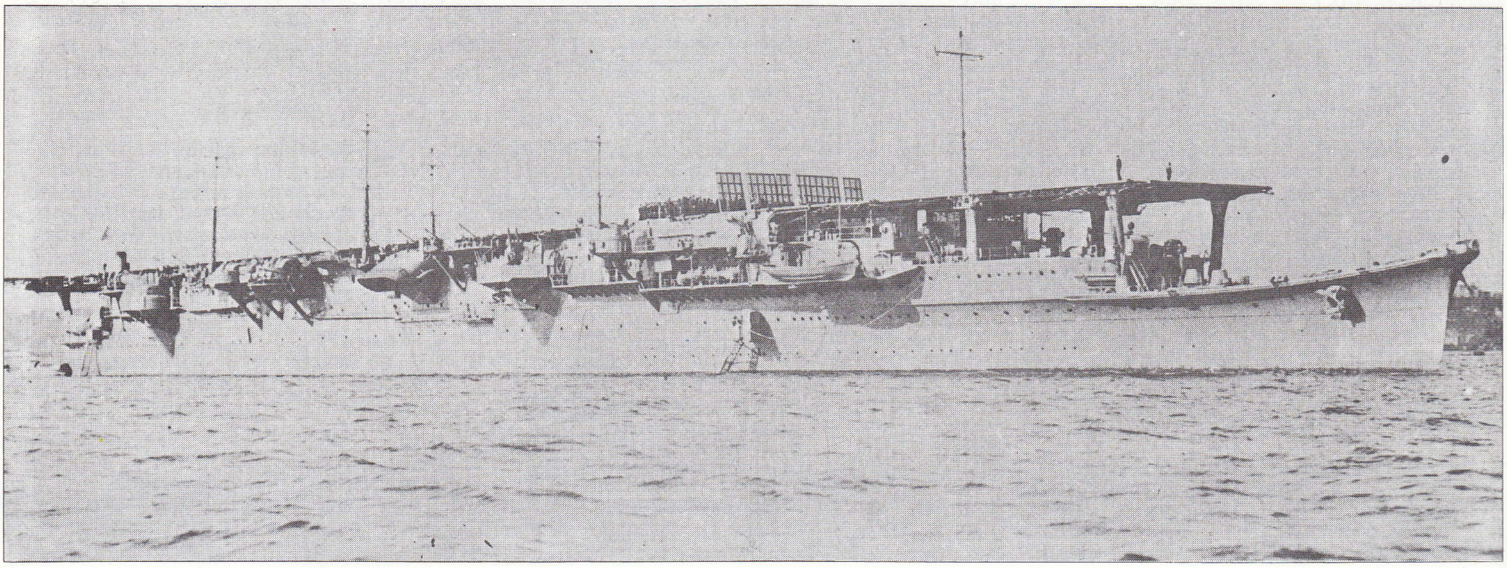
JAPAN

Shoho

The submarine tender *Tsurigizaki* had been serving with the Combined Fleet in 1939-1940, but as soon as the conversion of her sister *Takasaki* into a carrier was completed in December 1940 she was taken in hand, re-emerging in January 1942 as the light carrier ***Shoho***. *Shoho* did not see any action until the spring of 1942, when she covered the Port Moresby invasion, in the Support Force commanded by Rear-Admiral Aritomo Goto. It was this move by the Japanese which led to the Battle of the Coral Sea, the first carrier-versus-carrier battle in history.

The *Shoho* was heading for Port Moresby on 6 May 1942 when at 10.30 she was sighted 60 miles (100 km) south of Bougainville by four Boeing B-17 bombers. The four aircraft attempted a high-level bombing attack on the carrier, but caused negligible damage. The two sides were largely ignorant of each other's whereabouts. In a desperate attempt to find the American carriers, Takagi flew off reconnaissance planes for a dawn sweep on the next day. At 07.30 they reported a carrier and a cruiser, and the *Shokaku* and *Zuikaku* immediately flew off a large strike. Unfortunately the 'task force' turned out to be the US Navy oiler *Neosho* and her escorting destroyer, the USS *Sims*. It was a fatal error, for while the Japanese were sinking these ships they missed the chance of finding Task Force 17, and left the Americans time to discover the *Shoho*'s carrier group.

The luckless *Shoho* had been ordered to launch all available aircraft for an attack on the American carriers, and when at 09.50 the *Lexington*'s



Shoho *entered service in January 1942, but unlike* Zuiho *her operational career was extremely brief.* Shoho *had the unhappy distinction of being Japan's first aircraft carrier loss, sunk by aircraft from USS* Yorktown *on 7 May 1942 in the Coral Sea.*

***Shoho* (continued)**

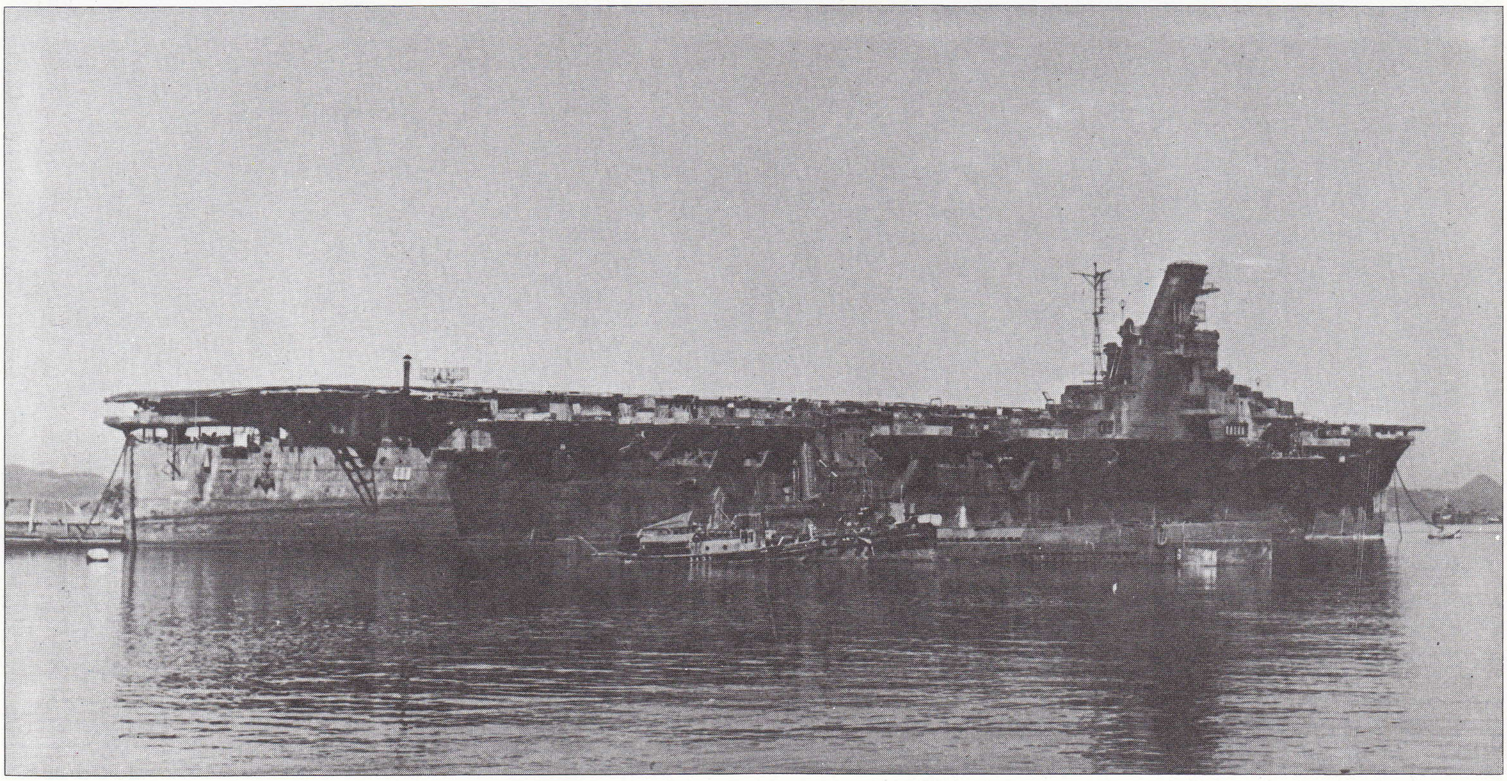
strike spotted her turning into wind they encountered no resistance. The first strike scored no hits, but a near-miss blew five aircraft off her deck. At 10.25 a second strike arrived, from the *Yorktown* this time. This strike scored two devastating hits with 1,000-lb (454-kg) bombs on the flight deck, in spite of a curtain of anti-aircraft fire from the *Shoho*'s escorts. The carrier reeled under the blows, and as she began to lose speed more bombs and torpedoes found their mark. According to Japanese records as many as 11 more bombs and seven torpedoes hit, and *Shoho* burst into flames.

Only six minutes after the last American plane had departed the order was given to abandon ship, and at 10.35 the burning carrier rolled over and sank. Only 255 men out of an estimated total of 800 on board were saved. The Japanese had lost their first aircraft-carrier.

Specification
Shoho
Displacement: 11,262 tons standard, 14,200 tons full load
Dimensions: length 204.8 m (672 ft 0 in) overall; beam 18.2 m (59 ft 8 in); draught 6.6 m (21 ft 8 in)
Machinery: 2-shaft geared steam turbines delivering 52,000 shp (38770 kW)
Speed: 28.2 knots
Armour: none
Armament: four twin 127-mm (5-in) dual-purpose and four twin 25-mm AA guns
Aircraft: 30
Complement: 785 officers and men

JAPAN

'Junyo' class aircraft-carriers



Seen at Sasebo after the surrender of Japan,* Junyo *displays the unusual funnel of the class. Converted from passenger liners, the two 'Junyo' class carriers were the first in Japanese service to feature a funnel on the island.

Like the trio of 'Taiyo' class ships that preceded them, the ***Junyo*** and her sister ***Hiyo*** of the **'Junyo' class** were useful conversions from Nippon Yusen Kaisha liners that had been designed from the outset with this procedure in mind. Where the earlier ships had undergone rebuilding at a late stage, the larger 'Taiyo' class ships were taken in hand before launching, both being in the water by June 1941, over five months before the Pacific War began, and completed in mid-1942.

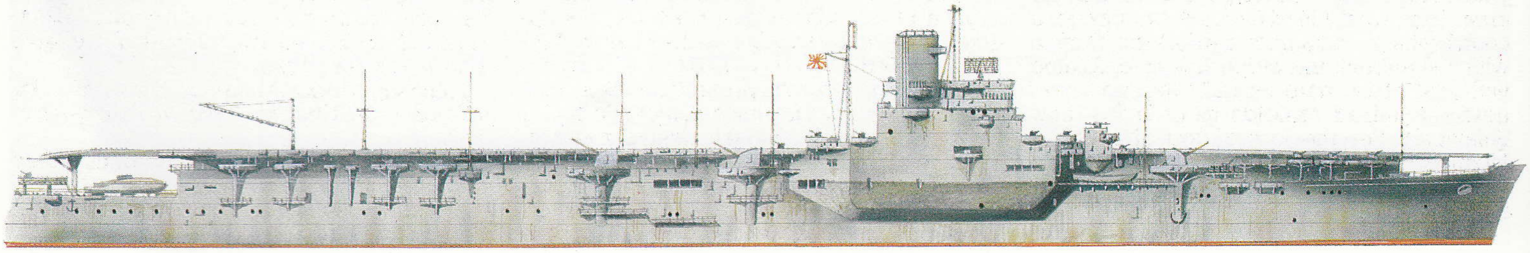
As they had been designed as passenger liners, they had considerable freeboard and could accommodate two hangars, albeit of restricted headroom. They also had respectably-sized flight decks, measuring 210.2 m by 27.3 m (689.6 ft by 89.6 ft), and two centreline elevators, but suffered badly from the combination of their low mercantile speed and lack of catapults.

The two ships were the first Japanese carriers to incorporate a funnel as part of the island, though it was of strange aspect, canted outward at a sharp angle. Except for the never-completed Italian *Aquila*, this pair of carriers were the largest ever converted from mercantile hulls.

Junyo's 53 aircraft could have had a decisive effect at Midway but the ship was engaged in the rather fruitless Aleutians diversion. At Santa Cruz in October 1942 her aircraft damaged the battleship USS *South Dakota* and a cruiser, playing also a significant role in the sinking of the carrier USS *Hornet*. The two sisters operated together as Kakuta's Carrier Division Two but, at the battle of the Philippine Sea, where Ozawa took on the vastly superior force of Mitscher's TF 58, the partnership was broken, the *Junyo* being heavily damaged by bombing and *Hiyo* sunk after blowing up. The *Hiyo* had been struck by two torpedoes and was probably lost from the detonation of a build-up of vapour from leaking Avgas tanks.

The *Junyo*, newly repaired, was torpedoed in December 1944 and, though she was not sunk, she never re-entered service, surviving to be one of the very few Japanese naval ships of any size to fall eventually into American hands.

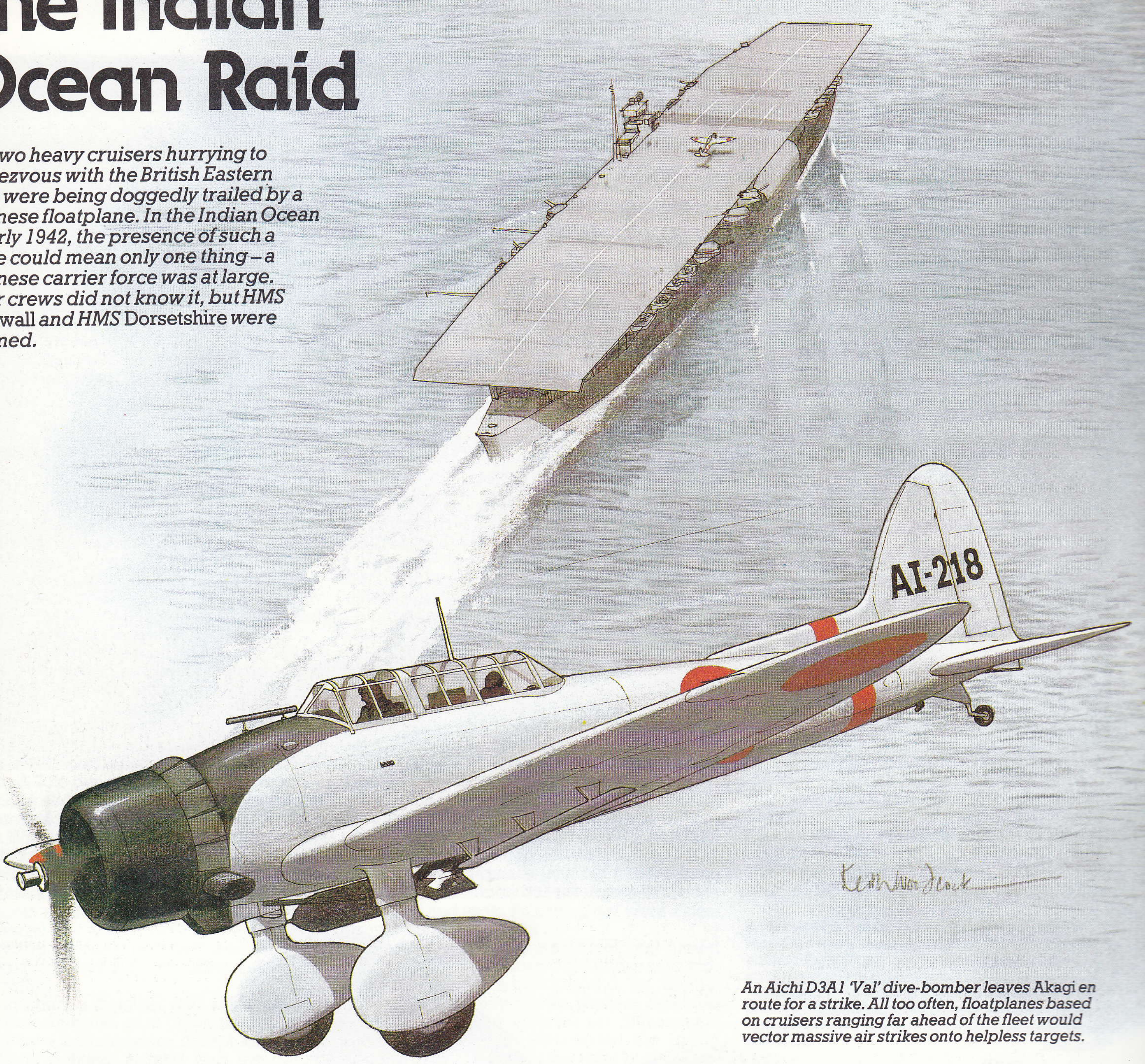
Specification
'Junyo' class
Displacement: 24,500 tons standard and 26,950 tons full load
Dimensions: length 219.2 m (719 ft 2 in); beam 26.7 m (87 ft 7 in); draught 8.2 m (26 ft 11 in)
Propulsion: geared steam turbines delivering 56,000 shp (41760 kW) to two shafts
Speed: 25 knots
Armament: 12 127-mm (5-in) DP and 24 25-mm AA guns
Aircraft: 53
Armour: none
Complement: about 1,220



While their capacious liner hulls had room for two hangars, the 'Junyo' class vessels suffered from a lack of speed, and without catapults aircraft operations were hampered. Both were at the Battle of the Philippine Sea,* Junyo *being damaged and* Hiyo *sinking.

The Indian Ocean Raid

The two heavy cruisers hurrying to rendezvous with the British Eastern Fleet were being doggedly trailed by a Japanese floatplane. In the Indian Ocean in early 1942, the presence of such a plane could mean only one thing – a Japanese carrier force was at large. Their crews did not know it, but HMS **Cornwall** ***and HMS*** **Dorsetshire** ***were doomed.***



An Aichi D3A1 'Val' dive-bomber leaves Akagi en route for a strike. All too often, floatplanes based on cruisers ranging far ahead of the fleet would vector massive air strikes onto helpless targets.

The shock effect of Japan's Pearl Harbor strike remains so great that it is widely overlooked that Nagumo's 1st Air Fleet went on within a few months to essay a similar exercise on the British. Four of his six fast carriers engaged in a preliminary warm-up on 19 February 1942 against Darwin and Broome in north western Australia. With the East Indies campaign all but lost, the combined ABDA (Australian, British, Dutch and American) forces were falling back and refugee shipping crowded the ports, which had the only developed facilities in the area. To prevent Allied forces regrouping for a counterattack, Nagumo's carriers hit Darwin with 188 aircraft; this strike was co-ordinated with that of 54 more aircraft working out of newly-acquired airfields in Celebes (now Sulawesi). For the loss of two aircraft the Japanese sank 12 assorted ships and spent a leisurely, and largely uncontested, hour reducing the base facilities and much of the town.

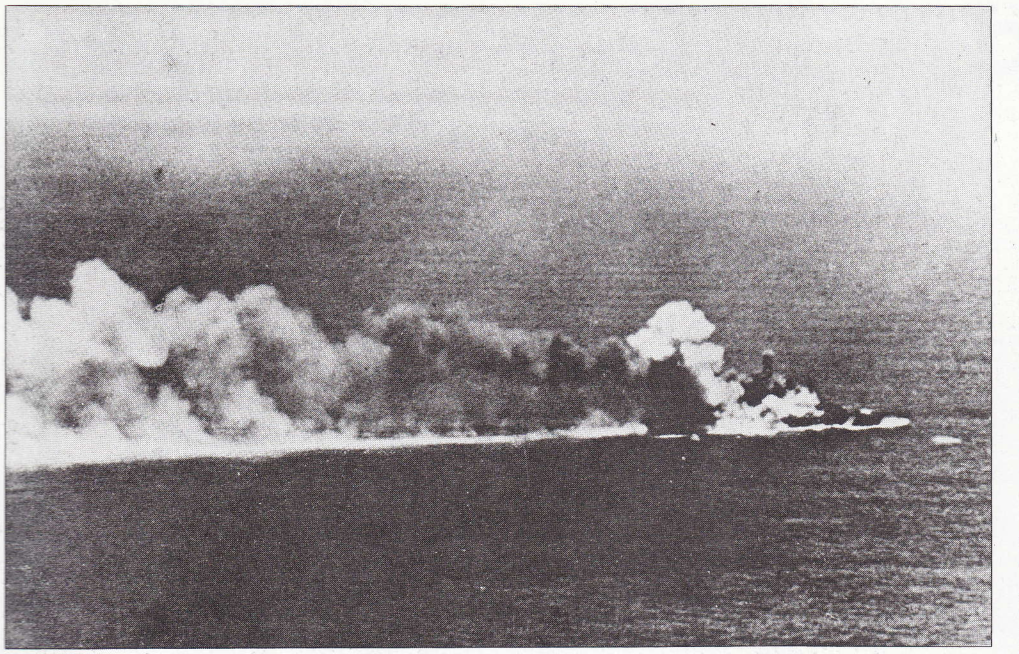
By late February 1942, the Japanese had gained most of their objectives in the East Indies, Malaya and the Philippines and, with land-based air power well established, the 1st Air Fleet carriers had a month's well-earned rest and self-refit period in Celebes before sailing for the Indian Ocean on 26 March. The force included all the carriers that had raided Pearl Harbor except the mechanically-defective *Kaga*, whose place was taken by the smaller *Ryujo*.

An Allied agreement about this time defined the Indian Ocean west of the Malayan peninsula as a British zone of responsibility, but the Royal Navy, fully stretched in the Atlantic, Arctic, and Mediterranean, could muster only a scratch force for its protection. Based on Ceylon, Admiral Sir James Somerville had a powerful paper force built around five battleships and three carriers. Only two of the carriers were modern, however, and four of the battleships were 'R' class units, too much outclassed by the enemy to be of more than sacrificial value. Sensibly, Somerville formed two separate forces, the older ships based back on Kilindini in East Africa and the remainder on Ceylon and the secret facility at Addu Atoll, 965 km (600 miles) away in the southern Maldives.

Intelligence reports indicating strongly a Japanese strike against Ceylon on or about 1 April 1942, Somerville kept his still-complete force well to the west by day, when he considered himself at greatest disadvantage, steaming eastward by night onto the expected Japanese approach. He relied on Ceylon-based Consolidated PBY flying-boats to give long-range early warning.

Although correct in essence, Somerville's intelligence was badly wrong with respect to time.

By the evening of 2 April, the British force needed to fuel and provision and had to return to Addu, except for the heavy cruisers HMS *Cornwall* and HMS *Dorsetshire*, the old carrier



HMS Dorsetshire *burns following a 90-aircraft strike. In company with HMS* Cornwall, *she was hurrying to meet the British Commander-in-Chief, Admiral Somerville, and his force when spotted by a cruiser-launched Aichi E13A 'Jake' floatplane.*

HMS *Hermes* and the destroyer HMS *Vampire* which, because of other commitments, were sent on to Ceylon.

Barely had Somerville reached Addu, on the evening of 4 April, than an air search spotted Nagumo less than 645 km (400 miles) south east of the island. Caught flat-footed, the British sailed immediately, although with no hope of forestalling the attack. Ceylon, uncovered, sailed the two cruisers to meet Somerville and braced itself for the onslaught.

As at Pearl Harbor the Japanese picked a Sunday, before breakfast, for the raid and shore-based radar tracked in the force of 126 aircraft as they made for the target, Colombo. Being protected by organized AA defences and the RAF, the harbour was not cleared of shipping. As it happened, the 40 or more fighters that met the Japanese lost half their number without managing to break up the attack. This, unlike Pearl Harbor, was directed more wisely at facilities, and only an old destroyer and an auxiliary were sunk. After the 30-minute attack, which lost the enemy seven aircraft, the port still functioned.

Unfortunately, just before midday, an Aichi E13A 'Jake' floatplane from the cruiser *Tone* sighted the two hurrying cruisers, half-way to their rendezvous with Somerville. For over three hours the aircraft dogged their heels until it vectored in a 90-aircraft strike. Lacking any air cover, the two British ships were swamped and sunk within 20 minutes, with the loss of over 400 lives. It was the worst blow of the day, emphasizing the total vulnerability of isolated warships to determined aerial attack.

Seeking to redress the balance, Somerville steered to intercept Nagumo at dawn on 6 April. The victorious Japanese did not oblige, probably fortunately for the British, who would almost certainly have been worsted.

Somerville remained convinced that Nagumo would strike again; suspecting Addu to be the target, he made his dispositions accordingly. He was wrong, for the enemy, having no knowledge of the base, was making a long detour to the east before closing the real objective, Trincomalee.

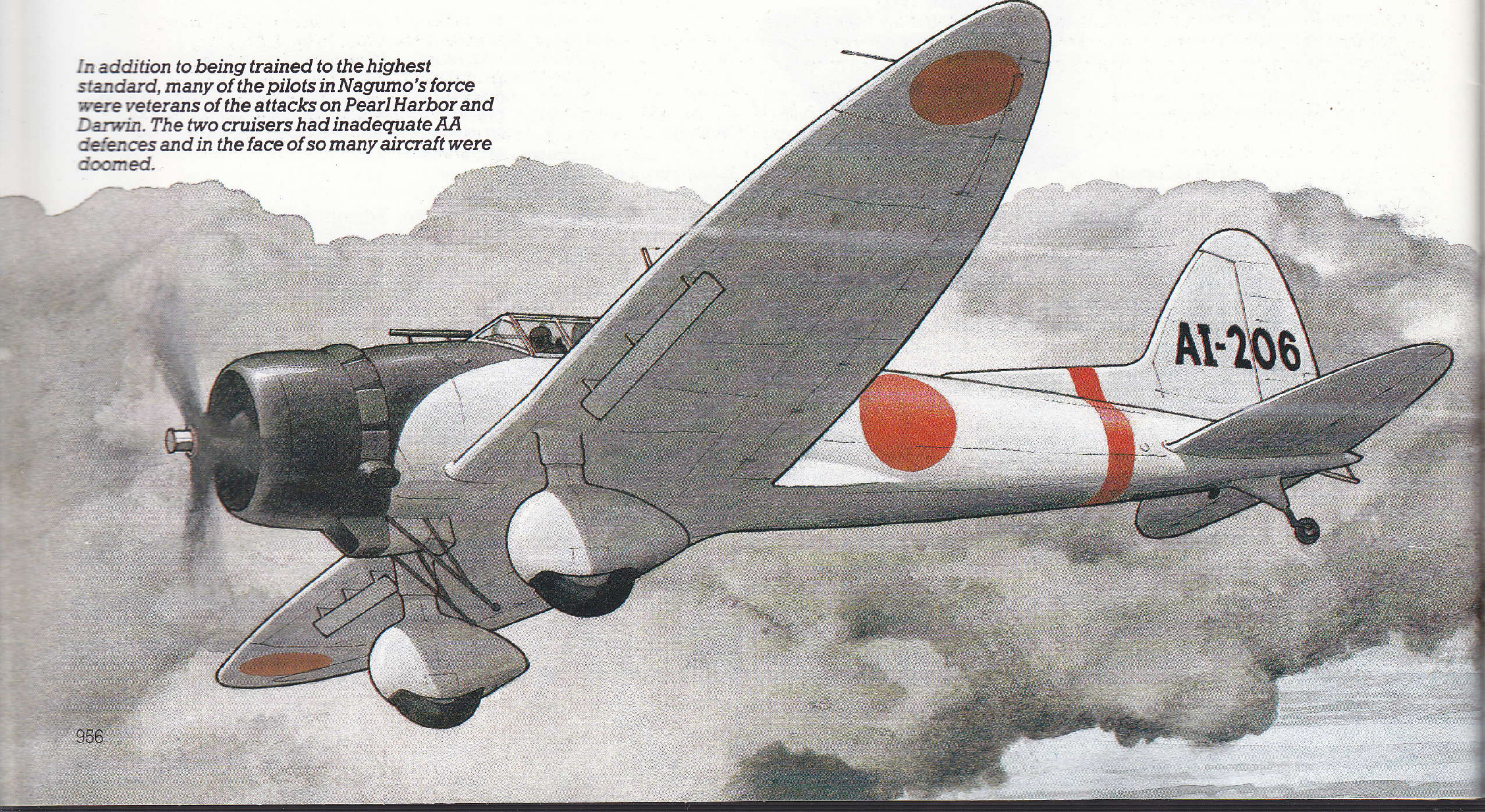
Japan victorious

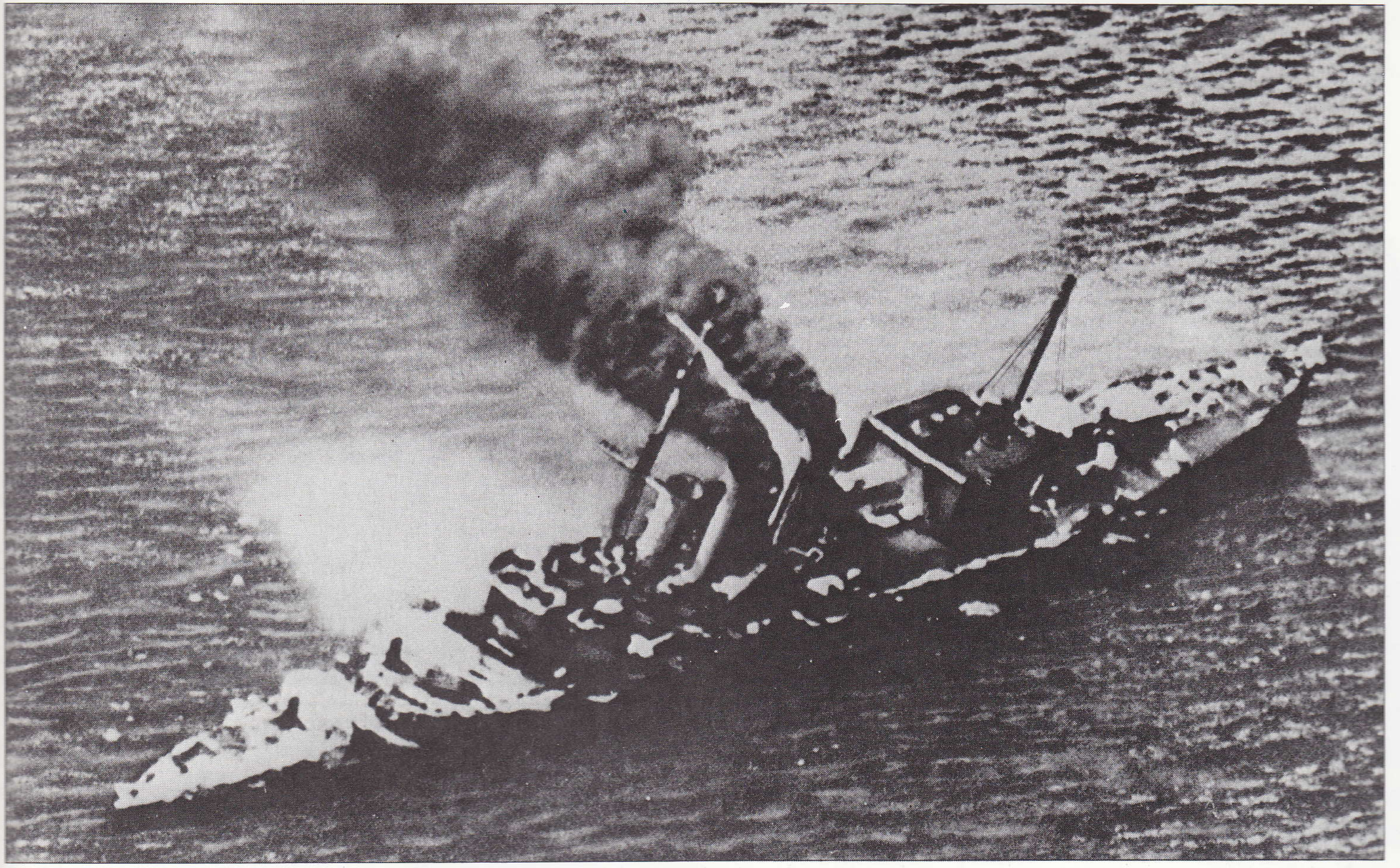
As the British force manoeuvred south west of Ceylon, there arose a further cause for concern. During World War I, the German cruiser *Emden* had exposed the vulnerability of British trade routes in the Bay of Bengal. To exploit the likely panic resulting from the Colombo attack, Nagumo had formed a separate raiding force, centred on the smaller carrier *Ryujo* which was, in any case, too slow to operate as part of the main group.

This force had sailed on 1 April from Mergui in newly-occupied Burma and had divided into three divisions to mop up mercantile traffic on the Orissa coast. In the space of 10 days the surface warships, backed by submarines and the *Ryujo*'s 48 aircraft, accounted for 28 merchantmen totalling 145,000 tons and had bombed a couple of ports for good measure.

The *Ryujo* group disengaged on 7 April, but the British were allowed no respite for, on the afternoon of the following day, Nagumo was again spotted by a Ceylon-based PBY, some 725 km (450 miles) to the eastward. Again, Somerville was at Addu, having just detached his older ships for the less hazardous waters of

In addition to being trained to the highest standard, many of the pilots in Nagumo's force were veterans of the attacks on Pearl Harbor and Darwin. The two cruisers had inadequate AA defences and in the face of so many aircraft were doomed.



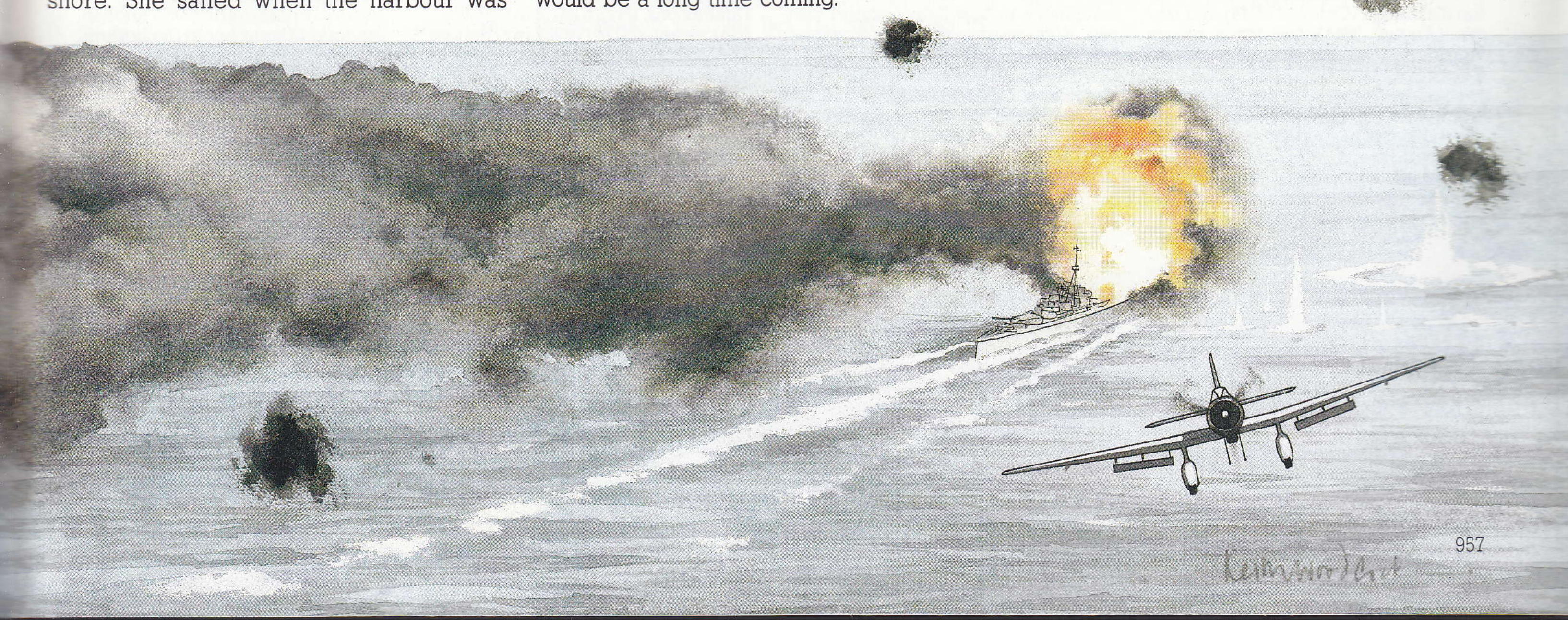


HMS Cornwall *founders following the strike by Nagumo's aircraft. After spotting the British cruisers, the E13A from the heavy cruiser* Tone *shadowed for three hours until the massive air strike could be vectored.*

East Africa. The Japanese course suggested either Trincomalee or Madras and, with no hope of a naval interception, the ports were cleared. Some 15 hours after the PBY's sighting report, 85 enemy aircraft hit Trincomalee. They found no shipping and few targets ashore, but again roughly handled the RAF who, outnumbered, lost nine aircraft for two. Nine British bombers actually became the first to attack the Japanese carriers, but suffered dearly for little return.

In the port, a freighter and a floating dock had been sunk and, as at Colombo, the results would have been meagre except for another floatplane sighting. A 'Jake' from the *Haruna* found the veteran carrier *Hermes* close inshore. She sailed when the harbour was cleared, carried no fighters of her own and was prevented by communications problems from calling up shore-based air cover. No less than 85 escorted dive-bombers saturated her with bombs. Within minutes, having absorbed an estimated 40 250-kg (551-lb) projectiles, she capsized and sank. Following her were a destroyer and two tankers.

Nagumo recovered his aircraft and turned for home. He had defeated the British as soundly as he had the Americans and, for the moment, the seas beyond the western Japanese defence perimeter were secure. Although the enemy never again penetrated the Indian Ocean in such strength, the scale of his activities had guaranteed that a counter-offensive would be a long time coming.



So accurate were the pilots of the Imperial Japanese Navy that in April 1942 they were achieving an 80 per cent target-hitting performance with their Aichi D3A1 'Val' dive-bombers. Given such accuracy and a 90-aircraft attack, it is hardly surprising that the British cruisers were overwhelmed in less than 20 minutes.

JAPAN

Taiho

In many ways technically the most advanced of the Japanese carriers, the ***Taiho*** was unique. In 1939 Japanese intelligence learned that the British 'Illustrious' class carriers would have armoured decks, and so a new type of armoured carrier was planned under the Fourth Reinforcement Programme. The appalling carnage of Midway lent even more emphasis to the need for armoured flight decks, and two units more were ordered in 1942.

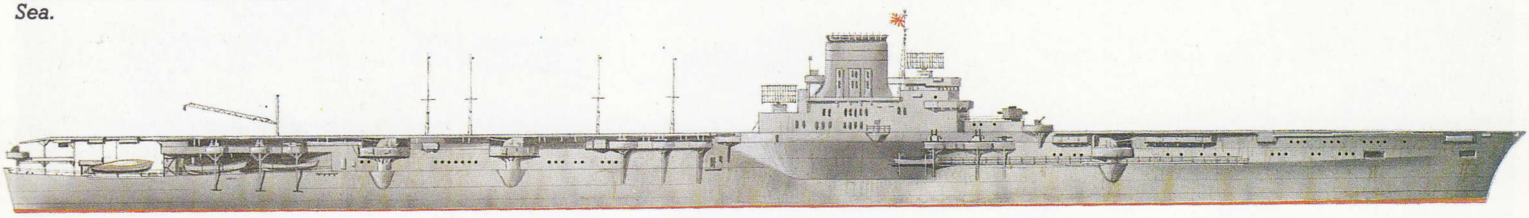
The Japanese design differed considerably from the British 'box-hangar' concept, for only the flight deck was protected by 75-mm (3-in) armour, and then only between the lifts. There were two hangars, the lower hangar being protected by 35 mm (1.3 in) armour as well. Waterline armour was also provided but on a more lavish scale, 150 mm (5.9 in) abreast of the magazines and 55 mm (2.2 in) over the machinery. All this armour involved a colossal topweight penalty, and to preserve stability the designers were forced to allow one less deck above the waterline, in comparison with the 'Shokaku' class. This meant that the lower hangar deck was just above the waterline, and the bottom of the lift-wells was below the waterline.

The opportunity was taken to use the latest defensive guns: a new high-velocity 100-mm (3.9-in) Type 98 twin mounting. For the first time an air-warning radar was included. It had been hoped to operate 84 aircraft, but only 75 could be spared by the time the ship was ready: the aircraft were available, but not sufficient aircrew.

The new carrier, to be called *Taiho*, was laid down in July 1941 and went to sea in March 1944. Immediately she joined Carrier Division 1, and was sent with the *Shokaku* and *Zuikaku* to Singapore. As soon as her air group was trained CarDiv 1 was sent to Tawi Tawi in the southern Philippines to join the First Mobile Fleet. On 19 June, during the Battle of the Philippine Sea, the *Taiho* had just launched her aircraft when the American submarine *Albacore* fired a spread of six 21-in (533-mm) torpedoes, one of which hit. Although her fuel tanks were ruptured, the *Taiho* lost only a little speed, and preparations were made to plank over the jammed forward lift, to permit flying operations to continue. But deadly gasoline vapour was spreading throughout the ship, and about 5 hours after the torpedo hits, some mischance (probably the switch on an electric pump) sparked off a colossal explosion. The armoured flight deck was split down the middle, the sides of the hangar were blown out, and it seems that holes were blown through the keel. About 90 minutes later the remains of the *Taiho* sank, taking with her all but 500 of her crew.

Specification
Taiho

Displacement: 29,300 tons standard, 37,270 tons full load
Dimensions: length 260.5 m (854 ft 8 in); beam 27.7 m (90 ft 10 in); draught 9.6 m (31 ft 6 in)
Machinery: 4-shaft geared steam turbines delivering 180,000 shp (134225 kW)
Speed: 33⅓ knots
Armour: see text
Armament: six twin 100-mm (3.9-in) AA and 15 triple 25-mm AA guns
Aircraft: 30 Yokosuka D4Y 'Judy' dive-bombers, 27 Mitsubishi A6M Zero fighters and 18 Nakajima B6N 'Jill' torpedo-bombers
Complement: 2,150 officers and men

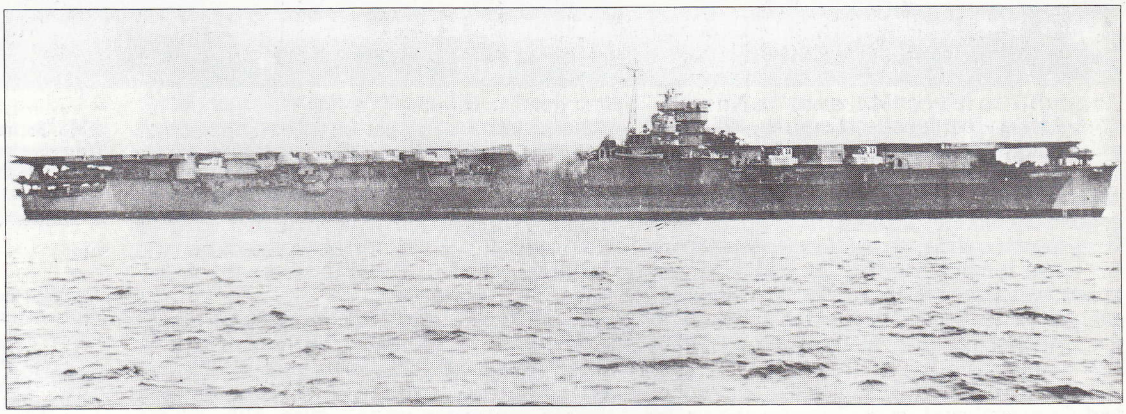


Probably the most advanced of all Japanese carriers,* Taiho *had an armoured flight deck, enclosed bow and the latest in AA defences (including an air warning radar for the first time).* Taiho *was lost just before the Battle of the Philippine Sea.

JAPAN

'Unryu' class aircraft-carriers

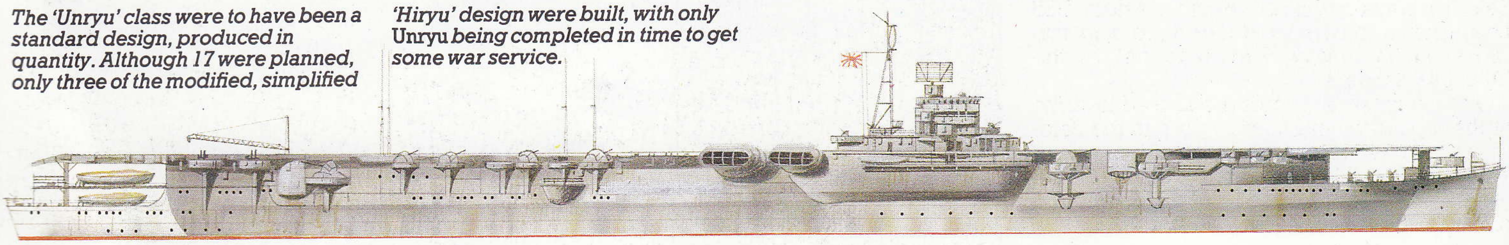
Like the Americans, the Japanese recognized that series production of a standard design was the only way of commissioning adequate numbers of good quality carriers in time to be of any use. To this end the basic 'Hiryu' design was modified and simplified, orders being placed at a variety of shipyards under the 1941-2 War Programme. Seventeen units of this **'Unryu' class** were planned initially but, even though construction of some had started before Midway, the catastrophe of this battle convinced the Japanese that shorter-term solutions needed to be found in a variety of conversions. These seem to have enjoyed higher priorities in the cause of haste, and the 'Unryu' class programme slowed badly, eventually halting through lack of materials. In the event, only three were ever completed and three more launched. The three completed were the ***Amagi*** (August 1944), the ***Katsuragi*** (October 1944) and ***Unryu*** (August 1944); the three others launched were the ***Aso, Ikoma*** and ***Kasagi***. The main differences between the 'Unryu' and the 'Hiryu' designs was an elevator less and an altered layout of main armament in the former. Though of about the same length, the 'Unryo' class ships gained stability through a greater beam yet, for some reason unknown, had a smaller aircraft capacity. For their size, they were well protected over vitals. Like all larger 'regular' Japanese carriers, the 'Unryu' class units had a good turn of speed, having the same machinery as later heavy cruiser classes. With shortages biting, however, two of those launched had to take a couple of sets each of destroyer machinery. Despite a one-third reduction in power, the speed penalty was only a couple of knots. The *Amagi* was lost to air attack in Kure during July 1945, the *Katsuragi* survived and was surrendered (for scrapping in 1947) and the *Unryu* was sunk in December 1944 by a US submarine.



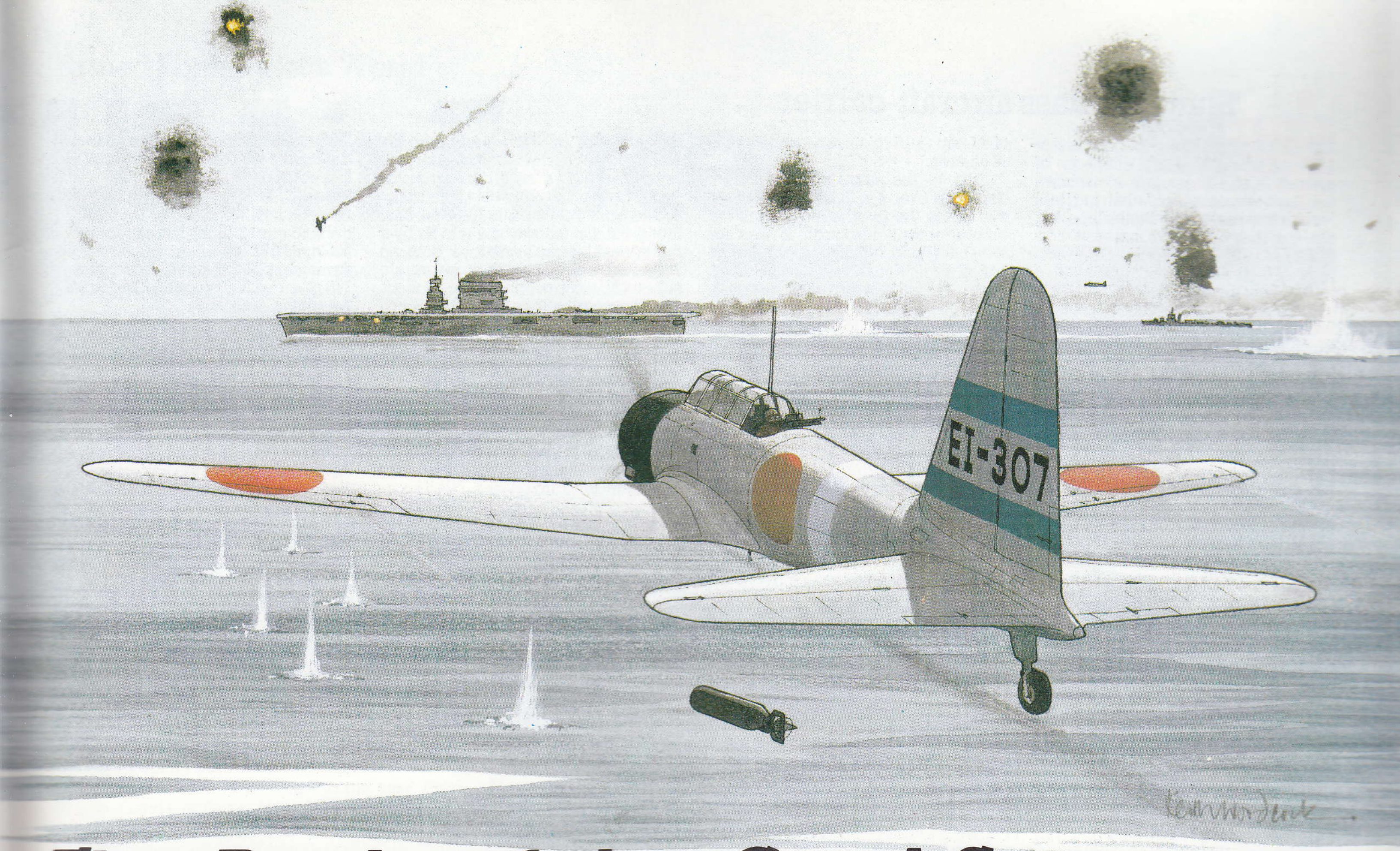
Unryu** at sea in 1944. She was not destined to serve long, being sunk in December 1944 in the East China Sea. Two torpedoes from the American submarine USS* Redfish *sufficed to send her to the bottom.

Specification
'Unryu' class

Displacement: 17,250 tons standard and 22,550 tons full load
Dimensions: length 227.2 m (745 ft 5 in); beam 22.0 m (72 ft 2 in); draught 7.8 m (25 ft 7 in); flight deck dimensions 216.9 m (711 ft 7 in) by 27.0 m (88 ft 7 in)
Propulsion: geared steam turbines delivering 152,000 shp (113345 kW) in *Unryu* and 104,000 shp (77555 kW) in *Aso* and *Katsuragi* to four shafts
Speed: 34 kts for *Unryu* and 32 kts for *Aso* and *Katsuragi*
Armament: 12 127-mm (5-in) DP and between 51 and 89 25-mm AA guns
Aircraft: 64
Armour: belt 25-150 mm (1-5.9 in); deck 55 mm (2.17 in)
Complement: 1,450



The 'Unryu' class were to have been a standard design, produced in quantity. Although 17 were planned, only three of the modified, simplified 'Hiryu' design were built, with only* Unryu *being completed in time to get some war service.



A torpedo bomber from Zuikaku *launches its torpedo against USS* Lexington. *The huge carrier suffered such severe damage that she had to be abandoned and sunk.*

The Battle of the Coral Sea

The capture of Port Moresby on New Guinea was an essential stage in the triumphant Japanese drive on Australia. To save the Allied cause in its infancy, the Japanese invasion had to be stopped.

The first significant setback to the Japanese came in May 1942, after their onslaught on the East Indies and a highly destructive foray into the Indian Ocean, when it seemed that nothing could stop them. However, the bases at Rabaul and Kavieng were vulnerable to Allied air attacks, and to rid themselves of this nuisance and to pave the way for the isolation of Australia, the Japanese high command decided to capture Port Moresby in southern New Guinea. An amphibious assault was planned, covered by two large carriers, the *Shokaku* and *Zuikaku*, plus the light carrier *Shoho*, carrying between them 147 aircraft.

On paper the Japanese forces could cope comfortably with any ships which the Allies could spare for the South Western Pacific, but the Allies held one trump card. Since 1940 the Americans had been reading the Japanese naval codes, and they knew that the Port Moresby invasion force would enter the Coral Sea. To counter this thrust the carriers USS *Lexington* and USS *Yorktown* were sent into the area on 1 May, four days before the Japanese carriers.

The *Yorktown*'s air group was used to strike at the Japanese landing on Tulagi in the Solomons, but over 100 sorties and the dropping of 76 bombs and 22 torpedoes achieved very little. Fortunately the *Yorktown* was then withdrawn to rejoin the *Lexington* in time for the first contact with the Japanese.

As so often happens, the first contact was accidental. While the Japanese carrier strikes were mistakenly attacking a fleet oiler and a destroyer, the American carriers were heading for a support group of two light cruisers, a seaplane tender and three gunboats. Reconnaissance planes on both sides made the vital sightings at last, and the American carrier aircraft quickly found the *Shoho*, sinking her with seven torpedoes. But the *Lexington* also came under attack, being hit by two torpedoes. The *Yorktown* was also hit by a large bomb which caused several casualties, but she survived a bad fire. At first the *Lexington* seemed to be standing up to the damage well, but about two hours after the attack gasoline vapour exploded deep inside her. In spite of this she continued to recover her aircraft, but all the while further explosions were causing havoc internally. After four hours the fires were out of control, and the carrier had to be abandoned. She was finally sunk by torpedoes.

In return for this serious reverse the American strikes damaged the *Shokaku* and destroyed many aircraft, together with their irreplaceable crews. Both sides withdrew to lick their wounds and to count the cost. For the Americans the loss of the *Lexington* had been a major tactical reverse, as the small *Shoho* was hardly fair exchange, but also on the credit side the projected expedition to Port Moresby had been abandoned. Furthermore, by convincing the Japanese that they had sunk the *Yorktown* rather than damaging her, the battle paved the way for the victory at Midway.

Shokaku, ***burning following a US strike. Coral Sea was the first battle fought between carrier forces, and served as a prelude to the decisive Midway action a month later.***

JAPAN

'Shinano' class aircraft-carrier

The catastrophic loss of four carriers at Midway, solely from the attentions of aircraft from US carriers, convinced the Japanese not only that carriers were more useful than battleships, but also that they needed to increase their numbers as a matter of great urgency. Most of their ambitious programme of conversions date from this point, none of them more impressive than the ***Shinano***. Created from the incomplete third 'Yamato' class battleship, this giant displaced nearly 72,000 tons full load, a figure not eclipsed until the advent of the US post-war supercarriers. The hull was already fitted with a 200-mm (7.87-in) armoured deck and vertical protection of the same order, and the ship's great beam (increased further by bulging) allowed for a flight deck of 80-mm (3.15-in) thickness over most of its area.

Despite the ship's size, her flight deck was over 1 m (3.3 ft) shorter than that of the *Taiho* of less than half the displacement, although it was far wider. Viewed probably as too slow to act as an attack carrier, *Shinano* was not even fitted with catapults and, although originally slated to have a small air group of 18 aircraft, she was completed to carry a still-undersized complement of 47. Her considerable stowage was looked upon mainly as a repair and re-supply facility for the front-line carriers.

Like the *Taiho*, the *Shinano* had an integral funnel and island, but lacked the smaller ship's British-style 'hurricane bow'. Her shortcomings were, in the event, of only academic interest. Not quite complete in time for the Japanese fleet's self-immolation at Leyte Gulf in October 1944, she transferred from Yokosuka to Kure for final fitting-out. On the way she was hit by a full spread of six torpedoes from an American submarine: her watertight subdivision still incomplete, she foundered from virtually uncontrolled flooding on 29 November.

Specification

'Shinano' class

Displacement: 64,000 tons standard and 71,900 tons full load

Dimensions: length 265.8 m (872 ft); beam 36.3 m (119 ft); draught 10.3 m (33 ft 10 in); flightdeck 255.9 (839 ft 7 in) by 40.1 m (131 ft 7 in)

Propulsion: geared steam turbines delivering 150,000 shp (111855 kW) to four shafts

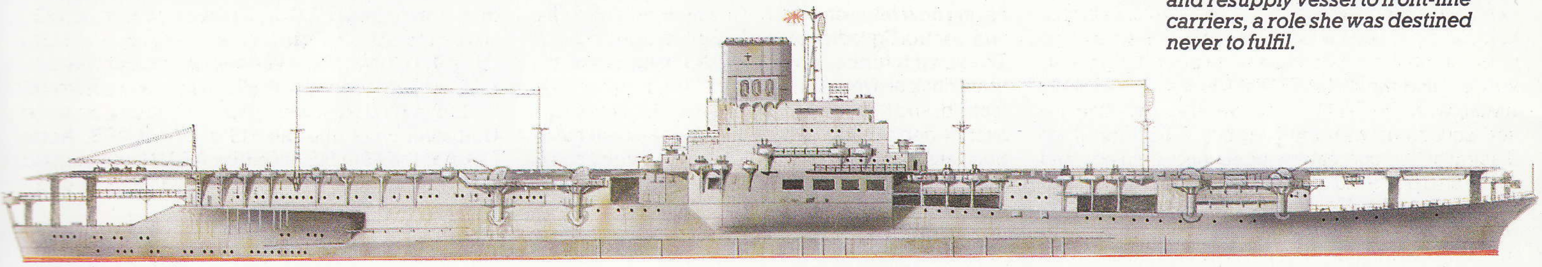
Speed: 27 kts

Armour: belt 205 mm (8.07 in); flight deck 80 mm (3.15 in); hangar deck 200 mm (7.87 in)

Armament: 16 127-mm (5-in) DP and 145 25-mm AA guns, and 12 28-barrel AA rocket-launchers

Aircraft: 18 (later 47)

Complement: 2,400



By far the largest carrier of the war, Shinano ***was to have been the third 'Yamato' class battleship. Her small aircraft capacity and slow speed pointed to her eventual role as repair and resupply vessel to front-line carriers, a role she was destined never to fulfil.***

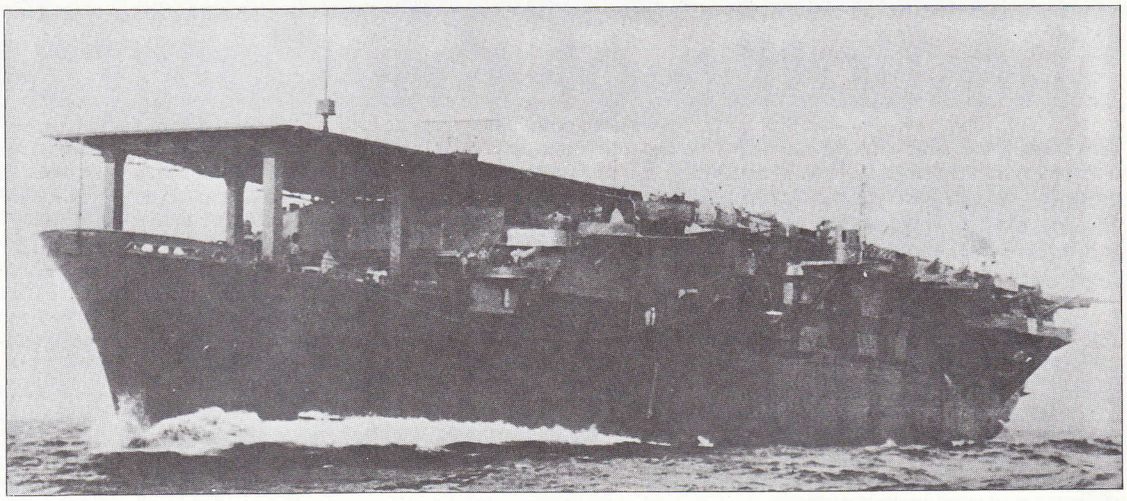
JAPAN

'Taiyo' class escort carrier

Carriers were required by the Japanese for other than fleet purposes. Firstly, and with increasing urgency, for the defence of trade. This was a function that had been badly neglected prewar due to a lack of hard experience and the belief that the war that they would promote would be a short one. Secondly, for the training of large numbers of aircrew for carrier operations, a task for which first-line units could not be spared. Thirdly, for the ferrying of aircraft, a task made essential by the sheer size of the newly-acquired empire, which had airfields thousands of miles from the homeland itself.

Like Western fleets, the Japanese navy rebuilt good-class mercantile tonnage into auxiliary carriers, particularly NYK ships, which had government-subsidized features built into them. The ***Taiyo*** was the first such example, converted from the *Kasuga Maru* in 1941 as the lead ship of the **'Taiyo' class**, before the outbreak of the Pacific war. After a few months of evaluation, the similar *Yawata Maru* and *Nitta Maru* were rebuilt into the ***Unyo*** and ***Chuyo*** respectively. Though of a larger size than Western escort carriers, none of them was equipped with arrester gear or catapults which, combined with their low speed, made aircraft launch and recovery difficult. All were lost to submarine torpedo attack within a space of 10 months between December 1943 and September 1944 having spent their lives engaged in auxiliary tasks.

Probably for reasons of availability, the first of the class, the *Taiyo*, was armed with 120-mm (4.7-in) guns, probably spare weapons from older destroyers.



Like the British and American fleets, Japan's need for escort carriers was met by converting merchant hulls. Kaiyo, seen here in late 1943, was similar to the 'Taiyo' class conversions.

Specification

'Taiyo' class

Displacement: 17,850 tons standard

Dimensions: length 180.1 m (590 ft 11 in); beam 22.5 m (73 ft 10 in); draught 8.0 m (26 ft 3 in); flight deck 171.9 m (564 ft) by 23.5 m (77 ft 1 in)

Machinery: geared steam turbines delivering 25,200 shp (18790 kW) to two shafts

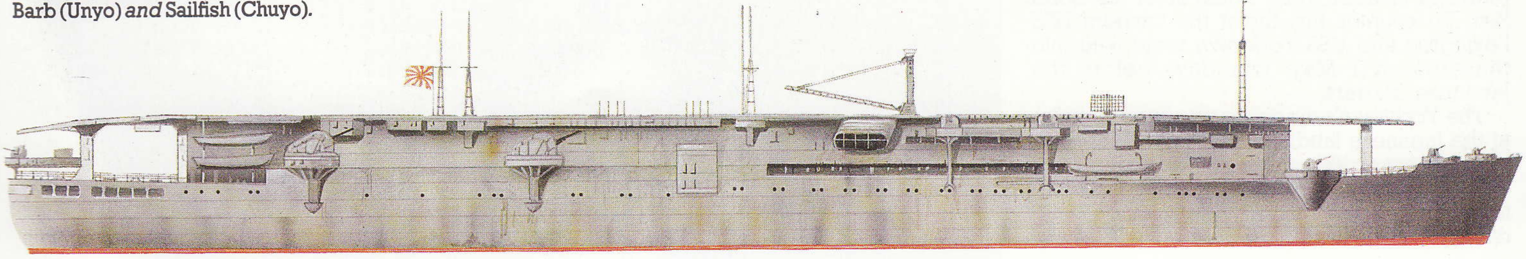
Armament: eight 127-mm (5-in) DP (except *Taiyo*, see text) and eight (later 22) 25-mm AA guns

Aircraft: 27

Armour: none

Complement: 800

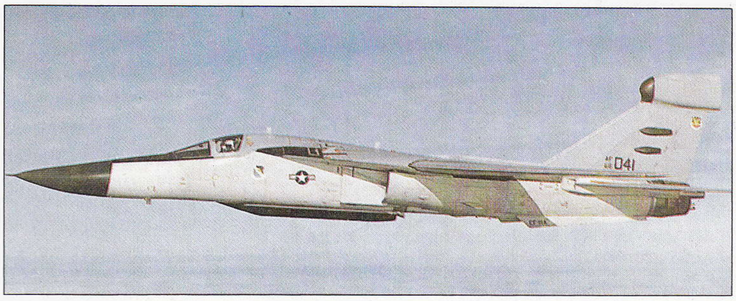
The three 'Taiyo' class vessels were largely used for aircraft transport and training. Their heavy AA armament was to no avail, all three succumbing to submarine attacks from USS **Rasher *(which sank* Taiyo), Barb (Unyo) *and* Sailfish (Chuyo).**



US Air Force

Part 4

The General Dynamics EF-111A electronic warfare aircraft is a total rebuild of the F-111A, intended to accompany strike aircraft and screen them with jamming and electronic countermeasures. The F-111A was nicknamed 'Aardvark', and the EF-111A has now been dubbed 'Spark 'vark'.



Direct-reporting units within TAC include the Tactical Fighter Weapons Center (TFWC) at Nellis AFB, Nevada, a large organization parenting subordinate group and wing structures. Of these, the 440th Tactical Fighter Training Group is probably the most significant for, although it has no aircraft of its own, it is responsible for organizing and managing 'Red Flag' exercises. TFWC's second element, the 57th Fighter Weapons Wing, is, conversely, very much in the aircraft-operating business, controlling a Fighter Weapons School with separate elements using the A-10A, F-4E and F-15 to provide advanced tuition in combat tactics. Other 57th FWW components include two Tactical Evaluation Squadrons, namely the 422nd TES at Nellis with examples of most combat types currently to be found in TAC service, and the 431st TES at McClellan AFB, California, with the F-111. There are also two 'aggressor' squadrons with the Northrop F-5E Tiger II for dissimilar air combat manoeuvring training, and these also play a major role in 'Red Flag'. Also reporting to the 57th FWW is the Air Demonstration Squadron, the 'Thunderbirds', which is back in business with the F-16A following a disastrous accident early in 1982 when four T-38 Talons were destroyed during pre-season work-up.

Moving a few thousand miles to the east, Eglin AFB in Florida is home base for the Tactical Air Warfare Center (TAWC) tasked with the development and testing of both weapons and concepts for tactical operations. Only a handful of F-4 Phantoms are operated by TAWC's 4485th Test Squadron, although aircraft of the Air Force Systems Command's Armament Division, also located at Eglin, are available for use by TAWC personnel as and when necessary. 'Blue Flag' training exercises are organized by TAWC's other subordinate unit, this being the 4441st TTG which, like the 4440th TFTG at Nellis, has no aircraft of its own.

The only other direct-reporting unit within TAC is the 552nd Airborne Warning and Control Wing. This, too, is a fairly large organization responsible for some eight squadrons distributed between no less than five air bases. Wing headquarters are maintained at Tinker AFB, Oklahoma, and it is here that the principal type, the Boeing E-3A Sentry, is concentrated, most of the 34 aircraft currently required having now been delivered. Three Airborne Warning and Control Squadrons (AW&CSs) are to be found at Tinker, with further single squadrons located at the two principal overseas operating centres at Keflavik, Iceland, and Kadena, Okinawa. These latter manage aircraft deployed from Tinker on a rotational basis. Such are the permanent units, but the Sentry has in recent years been despatched to overseas bases on numerous occasions and what seems like a near-permanent detachment is currently active in Saudi Arabia, at Riyadh, pending the delivery of Saudi Arabia's own fleet of five aircraft. Other 552nd AW&CW elements comprise the 7th Airborne Command and Control Squadron at Keesler AFB, Mississippi, with the Lockheed EC-130E Hercules for battlefield command activities; the 8th Tactical Deployment Control Squadron at Tinker with the EC-135K; and the 41st Electronic Countermeasures Squadron at Davis-Monthan with the EC-130H.

Following the demise of Air Defense Command during 1979-80, responsibility for the aerial defence of the continental United States passed to Tactical Air Command, and this organization now controls a separate and subordinate element to fulfil this task. Known as ADTAC (Air Defense Tactical Air Command) and managed from Langley AFB, Virginia, by a Deputy Commander, operational assets are confined to six Fighter Interceptor Squadrons (FISs).

Five of these squadrons are located in the USA itself and these are now being modernized, a long-overdue process of replacement of the veteran Convair F-106A Delta Dart by the F-15A Eagle. Coincidentally sharing Langley with TAC headquarters, the 48th FIS was first to convert in 1982 whilst the second squadron to re-equip, the 318th FIS at McChord AFB, Washington, received its first F-15A in the summer of 1983. In the early autumn of 1983 the F-106A soldiered on with the other three US-based units, the 5th FIS at Minot AFB, North Dakota; the 49th FIS at Griffiss AFB, New York, and the 87th FIS at Sawyer AFB, Michigan. All of these will also eventually receive the F-15.

ADTC's other operational unit is the 57th FIS, stationed at Keflavik, Iceland, and equipped with a dozen F-4E Phantoms. ADTAC is also responsible for management of the Air Defense Weapons Center at Tyndall AFB, Florida, providing realistic training opportunities in the field of air superiority. One of the major air combat manoeuvring ranges in the USA is located nearby, extending over several hundred miles of the Gulf of Mexico, where extensive use is made of drones for live missile firing exercises, examples of the Ryan Firebee, North American QF-100D and Convair PQM-102A all being regularly employed as targets.

So as to increase defensive coverage, extensive use is made of detachments, whilst fighter aircraft of the ANG and other TAC units also make a significant contribution to the protection of US air sovereignty.

Used for forward air control, target marking and counter-insurgency, the Cessna O-2A saw extensive service in Vietnam. The Rhodesians used similarly configured Cessna 337s during their long bush war.

12 PASS

No fighter in the world surpasses the General Dynamics F-16A for its cost-effectiveness, which rests on advanced engineering and aerodynamics. View from the cockpit with its enormous, frameless canopy is unequalled, and this, coupled with superb manoeuvrability, makes the F-16 second to none.

TACTICAL AIR COMMAND

HEADQUARTERS LANGLEY AFB, VA
9TH AIR FORCE, SHAW AFB, SC
12TH AIR FORCE, BERGSTROM AFB, Tx
AIR DEFENSE, TAC, LANGLEY AFB, Va
USAF SOUTHERN AIR DIVISION, HOWARD AFB, CANAL ZONE
USAF TACTICAL AIR WARFARE CENTER, EGLIN AFB, Fl
USAF TACTICAL FIGHTER WEAPONS CENTER, NELLIS AFB, Nv
552ND AIRBORNE WARNING AND CONTROL DIVISION, TINKER AFB, Ok

AIR DEFENSE, TACTICAL AIR COMMAND, LANGLEY AFB, Va
Deputy Command ADTAC, Colorado Springs, Co
aircraft operating assets comprise:
5 FIS, Minot AFB, ND (F-106A)
48 FIS, Langley AFB, Va (F-15A)
49 FIS, Griffiss AFB, NY (F-106A)
57 FIS, Keflavik NS, Iceland (F-4E)
87 FIS, K.I. Sawyer AFB, Mi (F-106A)
318 FIS, McChord AFB, Wa (F-15A)
USAF Air Defense Weapons Center, Tyndall AFB, Fl.
325 Tactical Training Wing, Tyndall AFB, Fl.
1 TFTS (F-15A)
2 TFTS (F-15A)
82 TATS (various drones)
95 FITS (T-33A)

552ND AIRBORNE WARNING AND CONTROL DIVISION, TINKER AFB, Ok
960 AW&CS, Keflavik NS, Iceland (E-3A)
961 AW&CS, Kadena AB, Okinawa (E-3A)
962 AW&CSS, Elmendorf AFB, Ak (Support for TDY E-3A)
963 AW&CS, Tinker AFB, Ok (E-3A)
964 AW&CS, Tinker AFB, Ok (E-3A)
966 AW&CTS, Tinker AFB, Ok (E-3A)
7 ACCS, Keesler AFB, Ms (EC-130E)
8 TDCS, Tinker AFB, Ok (EC-135K, WC-135B)
41 ECS, Davis-Monthan AFB, Az (EC-130H)

USAF Southern Air Division, Howard AFB, Canal Zone
24th Composite Wing, Allbrook AFS, Canal Zone (C-12A)
24th CS (O-2A)
Inter-American Air Forces Academy, Albrook AFS, Canal Zone
No aircraft assigned – uses A-37B on TDY from CONUS

USAF TACTICAL AIR WARFARE CENTER, EGLIN AFB, Fl
4441st TTG (no aircraft assigned, organises 'Blue Flag' command, control and communications exercises)
USAF Air-Ground Operations School, Hurlburt Field, Fl
4485 TS (F-4E, RF-4C, F-15A, F-16A, A-10A)

USAF TACTICAL FIGHTER WEAPONS CENTER, NELLIS AFB, Nv
554th Operations Support Wing – manages training ranges
57th Fighter Weapons Wing, Nellis AFB, Nv
A-10 FWS (A-10A)
F-4 FWS (F-4E)
F-15 FWS (F-15A/B)
F-16 FWS (F-16A/B)
64 TFTAS (F-5E)
65 TFTAS (F-5E)
422 TES (A-10A, F-4E, F-15A/B, F-16A/B)
431 TES (F-111E at McClellan AFB, Ca)
4477 TES (T-38A)
57 FWW Det 1 (UH-1N at Indian Springs AFAF, Nv)
57 FWW Det 2 (F-111A at Mountain Home AFB, Id)
4440 TFTG (no aircraft; organizes 'Red Flag' exercises)
Air Demonstration Squadron 'Thunderbirds' (F-16A/B)

9TH AIR FORCE, SHAW AFB, Sc
1st TFW, Langley AFB, Va
27/71/94 TFS (F-15C/D)
6 ACCS (EC-135H/P)
4th TFW, Seymour-Johnson AFB, NC
334/335/336/337 TFS (F-4E)
23rd TFW, England AFB, La
74/75/76 TFS (A-10A)
31st TTW, Homestead AFB, Fl
306/307/308/309 TFTS (F-4D)
33rd TFW, Eglin AFB, Fl
58/59/60 TFS (F-15A/B)
56th TTW, MacDill AFB, Fl
61/62/63/72 TFTS (F-16A/B)
347th TFW, Moody AFB, Ga
68/69/70 TFS (F-4E)
354th TFW, Myrtle Beach AFB, SC
353/355/356 TFS (A-10A)
363rd TFW, Shaw AFB, SC
17/19/30 TFS (F-16A/B)
16 TRS (RF-4C)
507th TACW, Shaw AFB, SC
21 TASS (O-2A)
703 TASS (CH-3E)
549th TASG, Patrick AFB, Fl
549 TASS (OV-10A)

12TH AIR FORCE, BERGSTROM AFB, Tx
27th TFW, Cannon AFB, NM
522/523/524 TFS (F-111D)
67th TRW, Bergstrom AFB, Tx
12/91 TRS (RF-4C)
45/62 TRTS (RF-4C)
366th TFW, Mountain Home AFB, Id
389 TFTS (F-111A)
391 TFS (F-111A)
390 ECS (EF-111A)
388th TFW, Hill AFB, Ut
4/16/34/421 TFS (F-16A/B)
474th TFW, Nellis AFB, Nv
428/430 TFS (F-16A/B)
429 TFTS (F-16A/B)
831st AD, George AFB, Ca
35th TFW, George AFB, Ca
21/39 TFS (F-4E)
20 TFTS (F-4E)
37th TFW, George AFB, Ca
561/563 TFS (F-4G)
562 TFTS (F-4E/G)
832nd AD, Luke AFB, Az
58th TTW, Luke AFB, Az
310 TFS (F-16A/B)
311/312 TFTS (F-16A/B)
405th TTW, Luke AFB, Az
426/461/550/555 TFTS (F-15)
425 TFTS (F-5B/E/F at Williams AFB, Az)
833rd AD, Holloman AFB, NM
49th TFW, Holloman AFB, NM
7/8/9 TFS (F-15A/B)
479th TTW, Holloman AFB, NM
433/434/435/436 TFTS (AT-38B)
836th AD, Davis-Monthan AFB, Az
355th TTW, Davis-Monthan AFB, Az
333/357/358 TFTS (A-10A)
602nd TACW, Davis-Monthan AFB, Az
23 TASS (OA-37B)